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HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

US Shipbuilding International Market Study

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

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NSRP PANEL SP-4

US SHIPBUILDING INTERNATIONALMARKET STUDY 1996-2005

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1. INTRODUCTION

The following report presents the results of a study undertaken by A & P Appledore International on behalf of NSRP SP-4, to forecast international commercial shipbuilding demand over the 10 year period 1996 to 2005. This has been done to a high degree of detail (58 separate categories of ship size and type have been reviewed), and with a particular emphasis to the potential for market penetration by US shipyards seeking to enter the commercial sector.

This has been done by reviewing both demand and competitive conditions (including prices), to identify those target sectors where the greatest opportunities lie. In doing this a great deal of emphasis has been placed. on checking and re-checking the assumptions on which the forecast is based, in particular with respect to likely scrapping scenarios and the prospects for trade growth. Forecasts are highly sensitive to these assumptions, and minor modifications can have a very major effect on the outcome of the forecast; often producing over-optimistic scenarios. Each sub-sector of the fleet has been examined individually however, to ensure the greatest degree of confidence possible.

The final outcome of the report is therefore the selection of broad target sectors that indicate an opportunity for US shipbuilders. This is not the end of the story however, and it is down to individual shipyards to develop a detailed market strategy based on this, to maximize the chances of successful market penetration. Marketing is not an isolated activity; it must be developed as a line function to direct corporate strategy, and must be fully integrated with all strategic decisions, including those related to production. For example, one of the early strategic decisions that must be taken is the type and shape of shipyard that is to be marketed : will it be a niche sector builder, building high value, long cycle products such as LNG carriers or cruise ships, or a volume tanker factory. Such decisions are critical and require an integrated approach between marketing and almost all other functions. This subject was dealt with fully by a paper “Marketing Strategy for Merchant Shipbuilders”, presented to the SNAME Production Symposium in Seattle in January 1995.

The market sectors selected for the study were as broadly as possible along generic lines within the fleet, without being over-specific, which would have the effect of distorting results. The size bands and types analyzed are as follows:

A: Tankers

5,000 to 20,000 dwt
20,000 to 50,000 dwt
50,000 to 100,000 dwt
100,000 to 200,000 dwt
200,000 dwt +

B: Chemical Tankers

5,000 to 10,000 dwt
10,000 to 20,000 dwt
20,000 to 50,000 dwt
50,000 dwt +

C: Bulk Carriers

5,000 to 20,000 dwt
20,000 to 50,000 dwt
50,000 to 90,000 dwt
90,000 to 200,000 dwt
200,000 dwt +

D: Combination Carriers

5,000 to 50,000 dwt
50,000 to 90,000 dwt
90,000 to 200,000 dwt
200,000 dwt +

E: General Cargo

5,000 to 10,000 dwt
10,000 to 20,000 dwt
20,000 dwt +

F: Container

5,000 to 10,000 dwt
10,000 to 20,000 dwt
20,000 to 30,000 dwt
30,000 to 40,000 dwt
40,000 to 50,000 dwt
50,000 dwt +

G: Reefers

5,000 to 10,000 dwt
10,000 to 20,000 dwt

H: LPG

5,000 to 10,000 dwt
10,000 to 20,000 dwt
20,000 to 40,000 dwt
40,000 to 50,000 dwt
50,000 to 60,000 dwt
60,000 dwt +

I: LNG

10,000 to 30,000 dwt
30,000 to 60,000 dwt
60,000 to 70,000 dwt
70,000 dwt +

J: Ferries

<5,000 GRT
5,000 to 10,000 GRT
10,000 to 20,000 GRT
20,000 GRT +

K: Passenger

<5,000 GRT
5,000 to 10,000 GRT
10,000 to 20,000 GRT
20,000 to 50,000 GRT
50,000 GRT +

L: Cargo RoRo

<5,000 GRT
5,000 to 10,000 GRT
10,000 to 20,000 GRT
20,000 to 40,000 GRT
40,000 GRT +

M: Vehicle Carriers

>5,000 GRT
5,000 to 10,000 GRT
10,000 to 20,000 GRT
20,000 to 40,000 GRT
40,000 GRT +

Finally, the report is structured as follows:

- Section 2 provides an Executive Summary.
- Section 3 overviews the historical background against which the forecast is made, in particular looking at the performance of the shipbuilding industty over the last decade.
- Section 4 outlines the methodology utilized to undertake the forecast.

- Section 5 presents details of the make-up of the fleet as exists, with particular emphasis on ownership and age. Age is one of the primary determinants of demand, and ownership one of the primary determinants of competition. The state of development of each sector of the fleet is also considered.

- Section 6 looks at the trade and economic aspects surrounding the fleet as a whole and within each sector, to derive forecasts of forward growth.

- Section 7 presents an analysis of the scrapping age of the fleet, in relation to potential life extension and aspects such as the ‘grandfathering’ of single-skinned tankers, and potentially of the ferry fleet.

- Section 8 presents the results of the demand forecast, comparing future demand with past output and identifying where the greatest growth potentially lies.

- Section 9 analyses the competitive conditions in each sector of the fleet, presents an assessment of shipbuilding capacity and reviews forward capacity utilization in light of the forecast level of demand.

- Section 10 reviews price behavior and buyer values and presents a forecast of the level of potential price rises above current poor price performance.

2. EXECUTIVE SUMMARY

Following more than a decade of decline and subsidized prices, the indicators of demand for the shipbuilding industry are more positive for the forthcoming decade.

Firstly, the fleet is significantly old and much of it is in poor condition. In the face of **a** life expectancy of around 25 years, coupled with mounting pressure against aging and sub-standard tonnage, the demand for replacement tonnage is forecast to be high.

Secondly, in the face of a more optimistic economic outlook, following the end of the recession that dogged the late 1980s and early 1990s, projected trade growth is good. Following heavy scrapping in the 1980s, fleet balance is reasonably good, and growth in trade will lead fairly directly to fleet growth.

Super-imposed on these primary trends are a number of secondary characteristics that will have a marked effect on the future shape of the fleet; changing trading patterns, for example.

Figure 2.1 presents the forecast to the year 2005, in terms of gross tonnage, with the previous peak of demand in the mid 1970's shown for comparison. The forecast shows a very marked increase in demand up to the middle of the forecast period, driven primarily by the need for the replacement of the tanker fleet. The presentation of the results in the form of tonnage is highly skewed by large ship types, and the presentation in Figure 2.2, showing number of contracts (ultimately a more useful measure, as shipyards deal in discrete units) shows a lower peak and more even demand.

Analysis shows that the available level of building capacity is likely to be sufficient to meet this demand. The capacity of the finance and scrapping industries to cope with this peak are more in question however, and the reader is referred to World Bank discussion paper "The Maritime Crisis" by Hans J Peters, for a full discussion of the risks surrounding this aspect.

Prices are forecast to rise in response to increasing demand by up to 40% above current levels, falling after the peak to a level between 20% and 30?40 above the current level. There are likely to be exceptions to this where local effects take over, such as the current very low price levels of container ships.

This price forecast however, depends on restraint in capacity expansion. Analysis shows that if this is not the case, prices would fall quickly after the turn of the decade, leading directly back to the subsidy situation that exists at this time.

Figure 2.1 :Past & Future Annual Demand

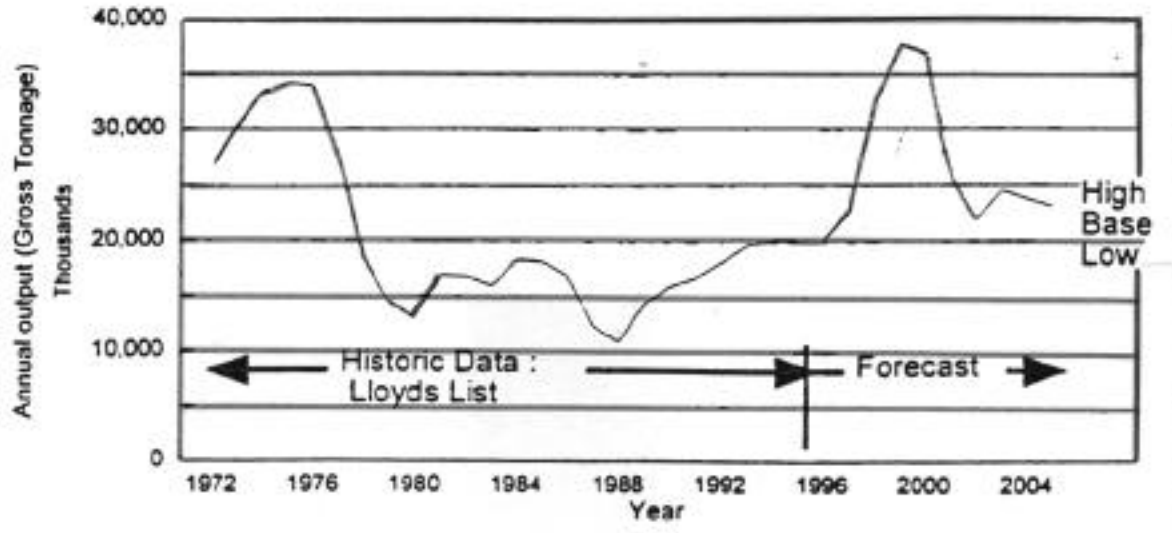
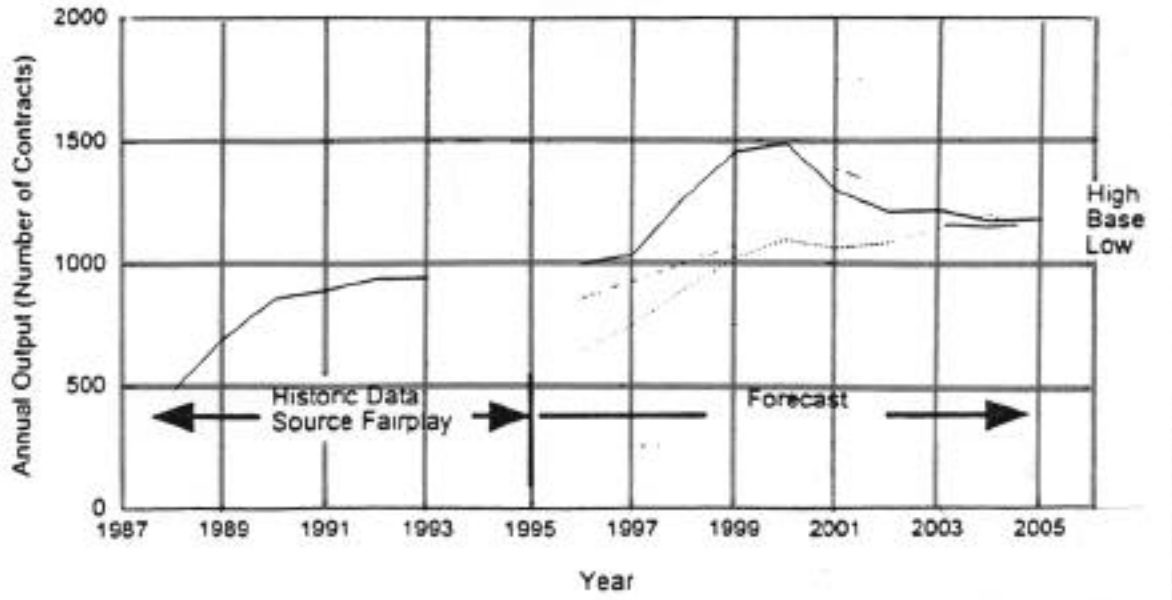


Figure 2.2 : Output and Demand Forecast



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As an overall summary, therefore, the forecast predicts a period of improved demand, and the potential for shipbuilders to return to profitability. However, it should be noted that the opportunity is transient, and the opportunity to generate profits is far from guaranteed. Price rises are not unlimited, and are measured from current very low subsidized levels. Only those shipyards achieving adequate performance levels are likely to be successful. This is a formidable task in the United States, in the conversion from military to commercial shipbuilding, with existing and target levels of performance discussed in full in NSRP Project 4-93-2, a study into competitiveness.

Each shiptype is summarized below in terms of demand characteristics and competitive conditions, prior to drawing the final conclusions, summarized in Table 2.1.

Tankers

Ž This is an important sector for the US fleet, for both US flag and flagged out tonnage.

Ž High volume demand is forecast, peaking over the first half of the forecast period. Very high demand growth will lead to good opportunities to gain market share.

• Greatest opportunities occur in the handysize/handymax sector, where good opportunities exist for standard designs and series ordering. Demand is also reasonably steady.

• Small tankers, below 20,000 dwt, also show good opportunities, although the potential for standardization and series building appears to be less.

Ž For the larger size ranges, demand is more transient, with the market being highly peaked. This is particularly so for VLCCs, with a short window of opportunity for builders in this sector. Aframax and panamax sectors also show lower levels of demand.

Ž Competitive conditions are also most difficult in the larger market sectors, with South Korea in particular competing strongly for large tankers. Competition for VLCCs is particularly intense.

• Having said this, export potential is very good in all sectors, and coupled with the strong US ownership in this sector, this should provide good opportunities for US builders.

• Prices achieved are reasonable and expected to rise along with predicted demand increases.

Chemical Tankers

• US ownership in this sector is limited, with only a small number (18) currently US flagged.

- The fleet is growing, but as it is only fairly small strong growth translates into a limited number of orders. Significant rises in the volume of orders are not forecast.

- Demand will be greatest in the smallest sector, under 5,000 dwt, and in the handysize sector. Limited demand is forecast in other size ranges.

- Ownership is dominated by Japan and North West European countries, and a strong degree of domestic ordering is seen in both sectors, limiting export potential. This is particularly the case for small ships below 10,000 dwt.

- Export potential increases with ship size, but so also does the degree of specialization of established builders with a track record in this sector.

- In the face of limited demand, lack of US relevance and relatively difficult market conditions, this sector is not recommended.

Bulk Carriers

- This is not a significantly important sector for US owners, with very few ships under US flag. Export opportunities are excellent however, coupled with high forecast growth in demand and reasonably steady demand up to 2005. This sector therefore offers significant builder potential.

- The greatest problem in building bulk carriers lies in low prices, requiring a very high level of performance to generate a profit. The characteristics of the market allow for standard designs and series ordering, which facilitates high productivity, but the design of facilities will have to be very specific.

- In order to generate profits in this sector, high throughput, low overhead series building factories are likely to be required, possibly entailing high investment in steelworking facilities in particular.

- The greatest opportunities undoubtedly lie in the handysize/handymax sectors, where greatest demand will be seen. Demand for cape size, panamax and small tonnage is low.

- The handymax sector is recommended, but given the reservations on the type of shipyard needed to compete discussed above.

OBO

- Demand for OBOs is forecast to be low and predominantly in the cape size sector.

- A small number of shipyards specialize in this sector, although basically it should be seen as an option on standard bulk carrier construction.

- As the larger sectors of the bulker fleet are not recommended for US shipyards, the OBO sector is also therefore excluded.

General Cargo

- Despite the decline seen in this fleet sector over the past decade, it is wrong to regard the type as obsolete, and good demand is forecast over the coining decade. High growth in demand will give the opportunity to gain market share and this is also a moderately important sector for US owners.

- The traditional tween-decker is obsolete however, and the type is likely to be replaced by multi-purpose container friendly ships that can act as feeder vessels or on liner routes, in addition to tramping.

Ž Increasing regionalization of trade will favor smaller vessels, below 10,000 dwt Opportunities also exist for slightly larger ships, up to 20,000 dwt, but with potentially fairly limited demand above that size.

Ž Few standard designs have yet emerged in this sector, but it is expected that this will occur with the expansion in demand, giving the opportunity for series building.

- In the smallest size range, competition is fairly regionalized, as is usual in a small ship sector. Greatest opportunities will therefore arise for US shipyards from the NAFTA region.

- Export opportunities improve with size, and the sector up to 20,000 dwt should also provide good opportunities, although it has to be said that at the time of writing this report, demand in this sector is poor.

Container

Ž The container market is difficult, although it is possible that the US owned fleet (90 container ships fly the US flag) could provide some opportunities for **US** builders, particularly in the larger ship sizes.

- Competitive conditions are very difficult and are likely to remain so. Prices **are low** and established specialist builders are struggling to maintain market share in the face of very heavy competition from Poland in particular.

- Demand is forecast to remain steady over the period to 2005, although with **no** significant rise above the current level of output. This implies that new entrants into the market will have to gain market share at the expense of existing builders, who are already short of work.

Ž There is also the danger of potential over-ordering in this sector, in particular at current low prices. This would mirror the disastrous behavior seen in the tanker market in the 1970s.

- The largest sectors of the market, above 40,000 dwt, offer the best opportunities in terms of competitive conditions in that Poland is absent from these sectors, although South Korean competition is strong in these sectors. Demand for larger ships is also fairly low.

- For these reasons, despite the importance of this sector in the US, the container market is rejected.

Reefers

- This fleet is of limited importance in the United States.

- As with containerships, only a limited increase in demand is forecast, and competition is likely to be difficult in relation to established specialist builders, although possibly less so than in the container sector.

- Specialization is a strong feature of this sector, although standard designs are few.

- It is possible that this sector could provide opportunities for US builders, although with low throughput. Strategically this would be best combined with other similar products to achieve adequate throughput.

LPG Carriers

- This is not an important sector for US owners and the fleet is small, leading to low levels of demand.

- Ownership is concentrated heavily in Japan and North West Europe and this is reflected in strong domestic ordering patterns.

- The level of demand is forecast to remain low in this sector (this is a niche market), with little increase in the period up to 2000. Demand increases slightly thereafter up to 2005. Demand for larger ships in particular (above 50,000 dwt), is forecast to increase in the second half of the forecast period.

- Having said this, the ownership of larger LPG carriers is dominated by Japan and few export orders are available in these sectors.

- It is thought unlikely that LPG carrier construction will provide significant opportunities for US builders.

LNG Carriers

- This is the smallest sector of the fleet, providing very low potential order numbers. (No shipyard could expect to build more than one to two ships per year at the very best). However, it is an important sector for US owners and this, coupled with the technical capability of US builders to construct such a sophisticated ship type, could lead to opportunities for US builders, particularly when coupled with good price levels.

- Demand is forecast to build up after the turn of the century, with the best opportunities for ordering in the second half of the forecast period. Ordering is forecast to be strongest in this period for large ships, above 60,000 dwt, and it is in this sector that US yards should concentrate.

- Competitively speaking, the number of shipyards capable of building this sophisticated ship type are few, and export potential is good. Having said this, it should be kept in mind that order numbers are very low: this is a very small niche market.

Ferries

- **The market** for ferries is forecast to build up in the second half of the forecast period, after 2000.

- It is anticipated that forthcoming safety legislation may lead to the 'grandfathering' of the ferry fleet, as happened with tanker legislation, but no wholesale replacement is forecast. Retro-fitting to bring ferries up to standard is likely to be a feasible option, unlike the situation in the tanker sector.

- The market is highly fragmented with demand strongly related to local opportunities. There is also a high degree of domestic ordering preference seen in this sector, often lead by Government requirements for home building.

- The greatest opportunities for export ordering lie in the 'super ferry' category, above 20,000 gross tonnes, although the number of potential orders is small, and this opportunity would best be combined with the potential to construct cruise ships, discussed below.

- In essence, opportunities for US shipyards will stem primarily from local domestic sources and there is therefore no change forecast from the current situation. A good example of the existing market would be the ferries currently under construction in Seattle for the Washington State Ferry Company. As such, this sector is not seen as offering any significant potential in the international commercial market, and is therefore excluded.

Passenger

- This is an important sector for US owners, in particular in the cruise sector. Having said this, few ships are US flag.

- Very strong growth has been experienced in the large cruise fleet in recent years; and this trend is currently forecast to continue. Relatively high and steady demand is forecast in all sectors in the period up to 2005, although in absolute terms the number of contracts is small. It is unlikely that shipyards will be able to contract to build at a rate greater than one or two ships per year, at the very best.

- The market divides broadly into two. Below 20,000 gross tonnes the market is highly fragmented, with many opportunities localized. US riverboats are a good example of this, and as such these sectors are generally already covered by US builders. For those already in the market some export opportunities may arise, although these are expected to be few with the market being difficult to cover due to this fragmented nature.

- The greatest opportunities may therefore exist in the larger cruise sector, although given that order volumes are low, as discussed above.

- As with LNG ships, the characteristics of this sophisticated ship type would be well suited to US yards, coupled with good prices and the importance of the sector to US owners. Competition should be anticipated to be intense however, from established specialist builders.

Cargo RoRo

- This is an important type for US owners, including military sealift, with a substantial US flag fleet (63 ships).

- The high average age of the fleet is forecast to lead to an increase in demand over the next decade, and this is likely to provide opportunities for US builders. In terms of timing, demand is expected to increase most significantly after the year 2000.

- Greatest demand is likely to occur below 20,000 gross tonnes. Limited opportunities exist above this size, but still producing some potential demand for US builders.

- The increase in demand over the forecast period is relatively small and export conditions are difficult. The primary opportunities for US yards will therefore arise from domestic building opportunities, or possibly from elsewhere within NAFTA. As this is not a true international opportunity this sector is recommended in this forecast cautiously, although it will almost undoubtedly provide work for US builders.

Car Carriers

- This is a small sector, and at the present time is of only limited importance in the US (10 ships only). This could change to a small extent, as 'Out-plants' in the US commence exporting, but even in these circumstances the fleet is likely to remain small.

- Building of these ships is strongly linked to the nationality of the vehicle builder and often to the company building the vehicle, such as Hyundai, Daewoo and Mitsubishi.

- Japan dominates the market at this time, as might be expected in this scenario. It is possible that isolated opportunities in this sector may occur for US builders, but no significant market is identifiable.

Based on the foregoing summaries, the following target sectors are recommended

Table 2.1

RECOMMENDED TARGET MARKET SECTORS

Sector	Recommended with Reservations	Strongly Recommended
Tankers:		
5,00 to 20,000 dwt		I
20,000 to 50,000 dWt		I
50,000 to 100,000 dwt		
100,000 to 200,000 dwt		
200,000 dwt+		
Bulk Carriers:		
20,000 to 50,000 dwt		
General Cargo:		
5,000 to 10,000 dwt		I
10,000 to 20,000 dwt		I
Reefers:		
5,000 to 10,000 dwt	*	
10,000 to 20,000 dwt	*	
LNG:		
60,000 to 70,000 dwt		I
70,000 dwt +		I
Passenger:		
20,000 to 50,000 GRT		I
50,000 GRT +		I
Cargo RoRo:		
<5,000 GRT	I	
5,000 to 10,000 GRT	I	
10,000 to 20,000 GRT	I	
20,000 to 40,000 GRT	I	
40,000 GRT +	I	

3. OVERVIEW AND HISTORICAL PERSPECTIVE

For much of the past twenty years, the shipbuilding industry around the world has been in crisis. Confidence has been severely damaged in the eyes of the financial markets, and the opportunity to generate profits in the shipbuilding industry has largely been absent.

The reasons for these problems can be traced back to a dramatic decline in demand in the mid 1970s. This is illustrated in Figure 3.1, showing the output from the World's shipyards in the period between 1958 and the present day.

The collapse in demand can be seen clearly from this graph. Between 1976 and 1980, output fell from around 35 million GRT produced per year to around 13 million GRT produced per year-a fall of over 60%.

In the period up to the peak, both ships and shipbuilding were seen as highly desirable by the finance industries; large numbers of new ships were constructed and shipbuilding capacity increased significantly with the construction of new shipyards. Following the collapse the industry was plunged into a crisis that persists up to this time.

It is important to understand the consequences of this collapse, and the nature of the long term effects on the shipbuilding industry.

- Firstly, along with the fall in demand, prices fell. It is important to understand that shipbuilding is a commodity based industry, and prices rise and fall with supply and demand.

- Secondly, in the face of scarce orders capacity reduced dramatically. Many shipyards closed and in some cases entire national industries closed (such as in Sweden). Other capacity reductions came about through rationalization in specific shipyards, with extensive capacity reduction exercises undertaken in both Europe and Japan, and in some cases shipyards withdrew from the international commercial sector, notably in USA and Canada. A measure of the reduction in capacity can be seen from Figure 3.2, showing the number of shipyards actively trading in the international sector. This capacity reduction was not instantaneous, and many shipyards hung on for as long as possible in the hope that the market would return.

- Thirdly, whilst capacity reduced, the reduction was insufficient to support prices and prices fell to below most shipbuilders costs. This lead directly to the program of subsidies that persists until today.

- Fourthly, shipyards struggling to survive in these very difficult economic conditions have in general embarked on programs of continuous performance improvements and cost reductions, and those shipyards that have survived have therefore expended much time and effort on becoming leaner and fitter.

Ž Finally, the large degree of surplus tonnage generated by the overheating o the market in the early 1970s seriously affected the supply/demand balance in the shipping market, in particular in the tanker sector. There were instances of ships constructed and scrapped without carrying a cargo. This in turn depressed freight rates and newbuilding demand. A reduction in fleet size was required, and only recently has a reasonable balance returned to the shipping industry.

The market reached a low point in 1987, but since that time there has been some signs of recovery, although prices and order book volumes have yet to improve to a point such that most of the world's shipyards can reliably generate a profit, and subsidies are still a common feature of shipbuilding around the world. The OECD international agreement seeks to phase out subsidies by 1996, but it remains to be seen if prices will rise to support this. The danger is that subsidies may be driven underground, with covert ways used to continue shipbuilding support.

The remainder of this section looks at prevailing market conditions and the general indicators surrounding the shipbuilding industry, in light of the above historical perspective.

Following the low point in demand in 1987/1988, order books rose sharply in the period up to mid 1990. This is shown in Figure 3.3 which presents an index of deadweight on order, set at 100 in 1987. Total deadweight on order rose from 31.6 million tonnes in the second quarter of 1987 to 74.9 million tonnes in the third quarter of 1990.

Prices rose considerably over this period in line with demand, as shown in Figure 3.4. This graph presents the movement in price of a range of ship types given as an index, again set at 100 in 1987. By the end of 1991, prices had risen in general by over 80% and many shipbuilders were gaining confidence that the long recession was coming to an end.

At the point in 1991 where prices peaked, a number of significant changes occurred in the market. Order books were getting full and a number of shipyards were booking forward orders for as much as two years ahead. Prices had also risen significantly, and plans to phase out subsidies in Europe over two years were well advanced.

Unfortunately the recovery did not last, and order books first stagnated and then fell, and the market has remained unstable since that time. Prices also fell and in the face of failing prices subsidies were again reinforced: the level of the subsidy ceiling in EU countries has remained at 9% for the past three years.

Since the start of 1993 the volume of deadweight on order has been rising steadily, although prices have yet to follow suit. There appear to be a number of reasons for this:

- Whilst deadweight on order is rising, orders are skewed to the larger end of the market. The number of ships on order has not risen as significantly although there are signs that order numbers are now picking up. This is illustrated in Figure 3.5.

Ž Order books in Japan and South Korea have been rising, but the availability of orders has not yet spilled over to other shipbuilding regions, and the level of ordering in Europe and the rest of the world has not yet risen significantly. This is illustrated in Figures 3.6 and 3.7, which track order books since 1990, in terms of deadweight (3.6) and number of contracts (3.7).

One of the greatest concerns at this time is related to the expansion of capacity, in particular in South Korea. Most shipbuilders are 'gearing-up' for the anticipated increase in demand for new ships, but South Korea has responded more than most by expanding capacity. At the time of preparing this report, the new Korean capacity is coming on line, soaking up much of the increase in demand, and suppressing prices. In effect, the South Korean industry has increased the inertia in the market and at best this has delayed the onset of higher prices. At worst, it may suppress the level of future price rises.

At the end of the fourth quarter of 1994, the commercial order book stood at 75 million DWT and 1,741 contracts.

Further increases in order book volumes will be required to improve confidence and to trigger prices to rise. However, the potential for prices to rise significantly to levels seen in 1991 and above, is present. It is one of the features of the shipbuilding industry that very large price fluctuations occur (both up and down) and this is one of the reasons why commercial shipbuilding is a notoriously difficult industry. A quick glance at the price index shown in Figure 3.4 demonstrates the magnitude of price fluctuations that are possible over a relatively short period of time.

With respect to the potential for further increases in the order book, a number of important trends are currently developing, many of which are a consequence of the low level of newbuilding over the past 15 years, most current indicators are positive.

- Freight rates: These are of prime importance in the shipowner's decision as to whether or not to build a new ship, because freight rates determine potential income. Figure 3.8 presents APA's index of freight rates, taking account of dry and wet bulk rates, and container ship chartering. Rates have risen significantly over the second half of 1994, driven primarily by improvements in dry cargo rates. Liquid bulk rates have remained fairly level, as has container ship chartering. The implications of these conditions are important. The continuation of difficult market conditions in the tanker sector suggests that the fleet may be suffering still from over-capacity, particularly due to the large number of deliveries over the past three years. New ships expand the fleet by virtue of higher efficiency, in addition to physical capacity. Some further attrition in the tanker fleet may be necessary to restore a balance and raise freight rates to an economic level.

In the case of the container fleet, heavy newbuilding over recent years has increased capacity significantly. The fleet continues to grow at a high rate, and there is a danger of the introduction of over-capacity. At some point a slow-down in the rate of container ship building is likely, although at this time the balance in the fleet is still good.

- Following the extended period of restructuring that has accompanied the shipbuilding recession, the industry is in a much better shape to take advantage of any forecast market upturns than was the case in the 1970s and early 1980s. Firstly, much of the over-capacity in terms of facilities present in the second half of the 1970s and early 1980s has been eliminated, and secondly those shipyards that have continued trading are in general more efficient and leaner, having focused strongly on performance improvement over the past decade. Having said this, there are a number of concerns over capacity, and it should be remembered that excess capacity is responsible for the suppression of prices below the economic level.

New shipyards are being constructed in South Korea and China, and a major modernization program is underway in Germany. To this must be added the potential commercialization of US capacity that has, up to this point, been primarily involved in Government work, and the potential commercialization of Former Soviet Union Shipyards, although this latter threat should not be over-emphasized. Further capacity increases arise from increasing efficiency in existing shipyards.

- With building at a low level for 15 years, the levels of surplus tonnage generated in the fleet during the last boom has been gradually scrapped out, in particular in the tanker sectors. Figures 3.9 and 3.10 show how surplus tonnages in the two main fleet sectors have moved in recent years. The fleet is approaching something of a balance, and in this case demands of increasing trade translate more readily into a demand for new ships. Having said this, as indicated above, some further attrition may be indicated from the tanker fleet.

- Another consequence of the lack of newbuilding in recent years has been that the fleet has aged. The average age of the fleet is currently around 17 years. Likely triggers for scrapping include special survey periods at which point significant expenditure may be required to bring ships up to standard, to enable them to continue trading over the subsequent 5-year period. Figure 3.11 presents a graph of the expected frequency of fourth and fifth special surveys, the fifth special survey point being at 25 years of age. It can be seen that the peak of fifth special surveys is approaching and this is likely to trigger a significant period of scrapping. Scrapping has picked up significantly in the recent past, as indicated in Figure 3.12.

Ž Finally, the regulatory pressure against aging and sub-standard tonnage is rising. As a consequence of low freight rates in recent years, maintenance of many ships has been minimized by owners trying to improve cashflow. Many ships are therefore both old and poorly maintained, and there is increasing concern over sub-standard tonnage. Pressure on scrapping is being exerted by National Governments and Institutions (for example in the US through 0PA90 and Coast Guard surveillance), and through port state control measures in US, Europe and the Far East. It is becoming increasingly difficult to operate sub-standard tonnage.

So, in the longer term, indicators are generally positive with respect to increasing demand for new tonnage.

- The fleet is aging.

Ž Scrapping is increasing.

Ž The surplus tonnages seen in the 1970s and 1980s no longer exists.

- Freight rates are rising, in particular in the dry cargo sectors.

Ž World trade is growing.

Having said this, at the time of writing this report the industry remains in recession, despite rising deadweight volumes on order. Prices are remaining persistently low and the causes of this situation require careful analysis.

Firstly, there is a deep rooted lack of confidence in the industry, in the face of concerns about the availability of finance to renew the fleet, and possible over-capacity in the shipbuilding industry around the world.

Secondly, whilst the total deadweight on order has risen steeply, much of the recent increase in the order book has been for large tonnage, and the availability of contracts has risen less steeply. This is illustrated in Figures 3.6 and 3.7, showing the development of the order book by both deadweight and number of ships.

Thirdly, much of the recent upsurge has been due to increasing volumes in South Korean shipyards, as can be seen clearly again from Figures 3.6 and 3.7. These contracts have generally been fixed at low prevailing prices, and a general increase in prices will follow South Korean capacity becoming full. There are signs that this is now occurring, with South Korean yards booking orders for 1997.

Figure 3.1 : MERCHANT SHIPS COMPLETED

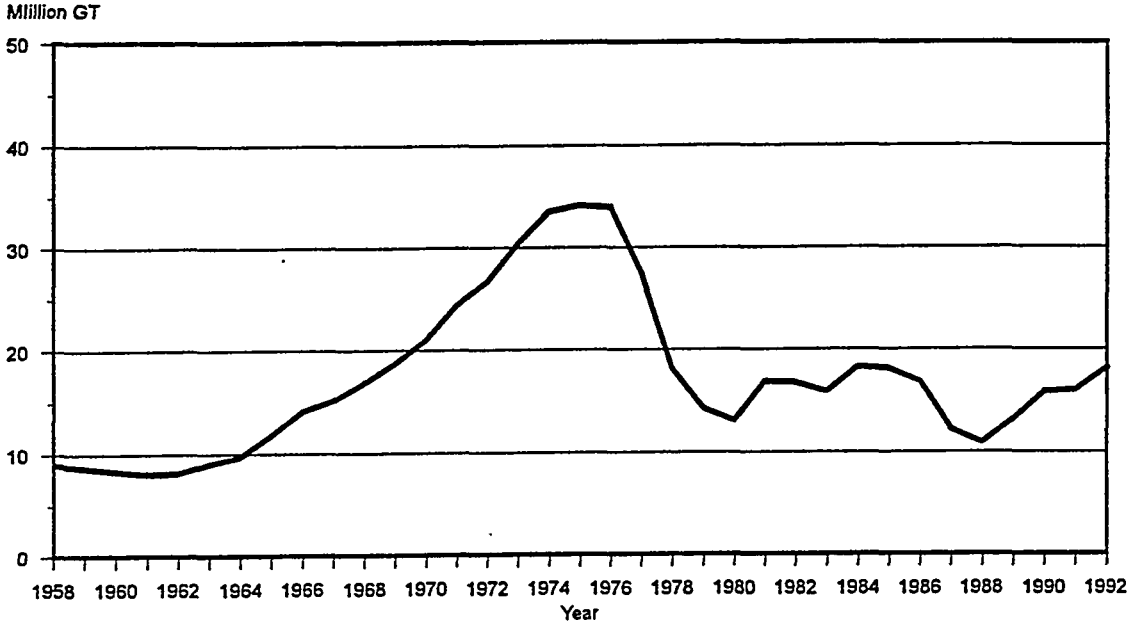

Figure 3.2 : NUMBER OF TRADING SHIPYARDS

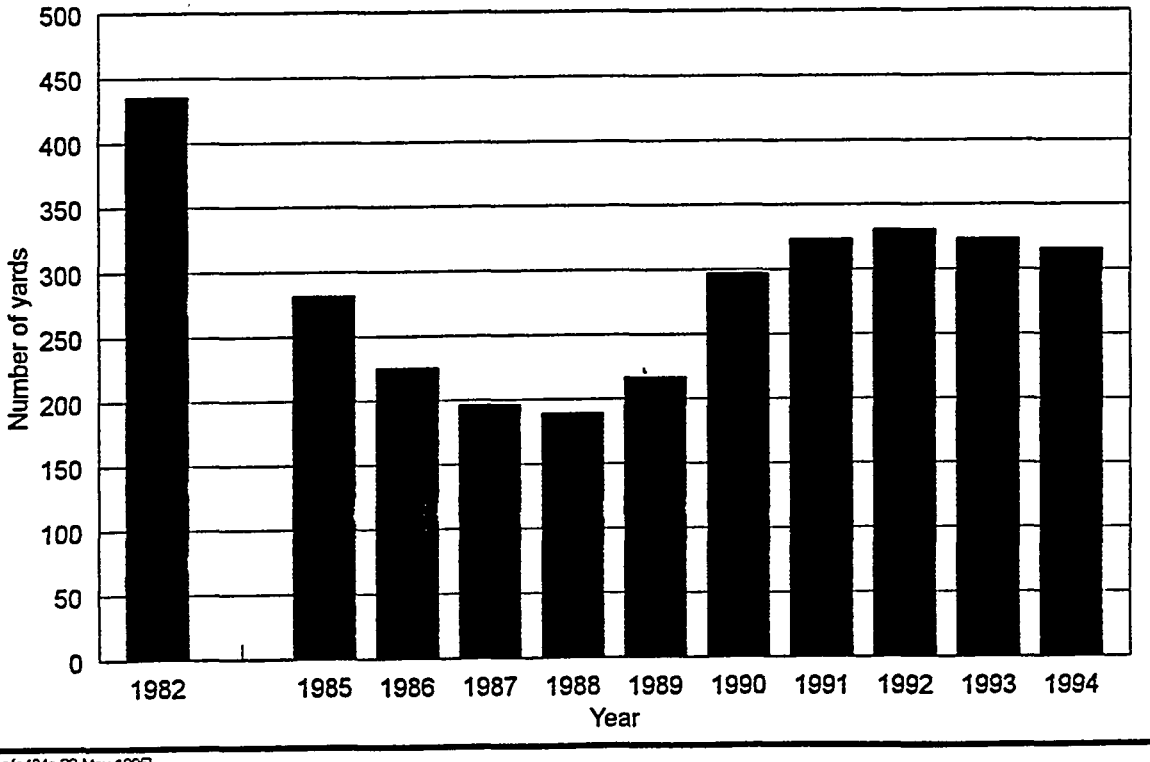

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Figure 3.3 : DEADWEIGHT INDEX

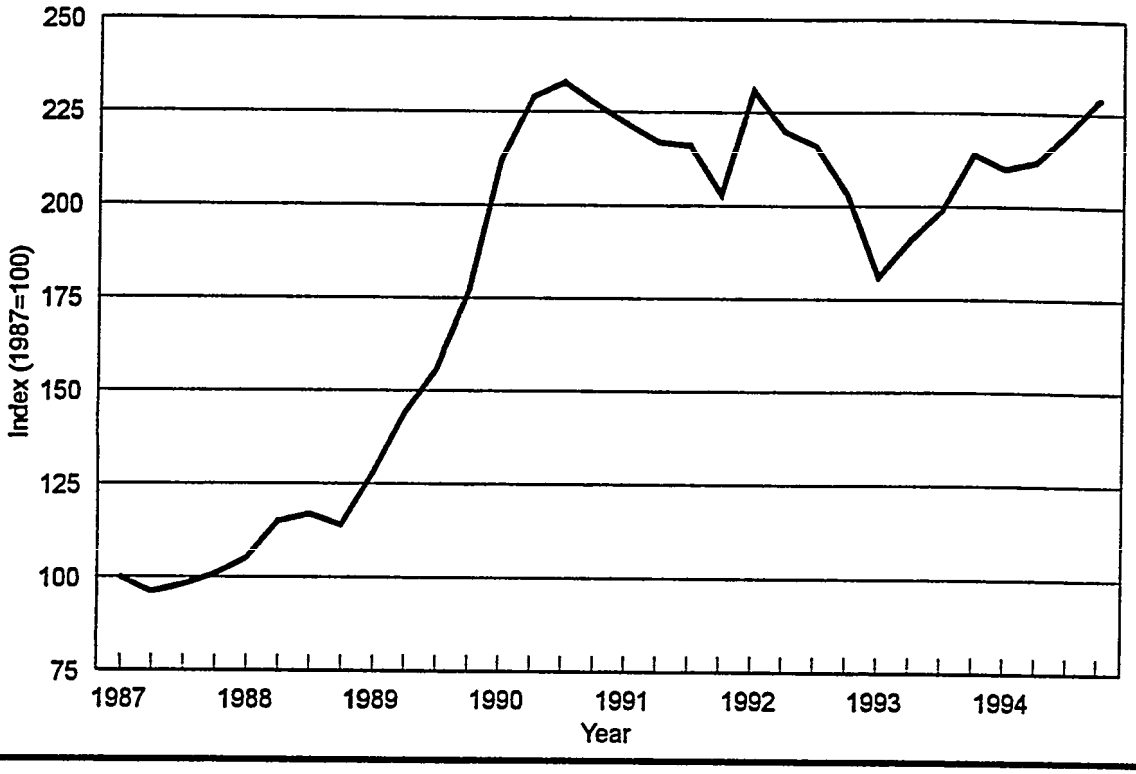

Figure 3.4 : PRICE INDEX

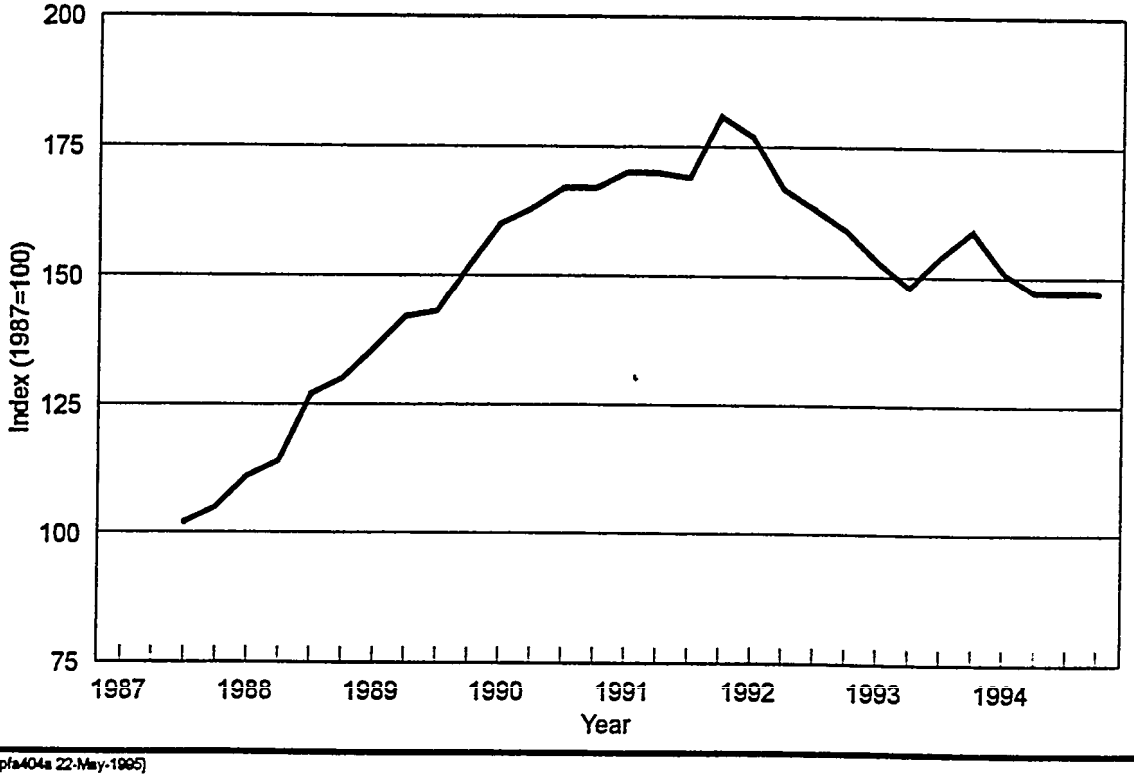

Figure 3.5 : SHIPS ON ORDER

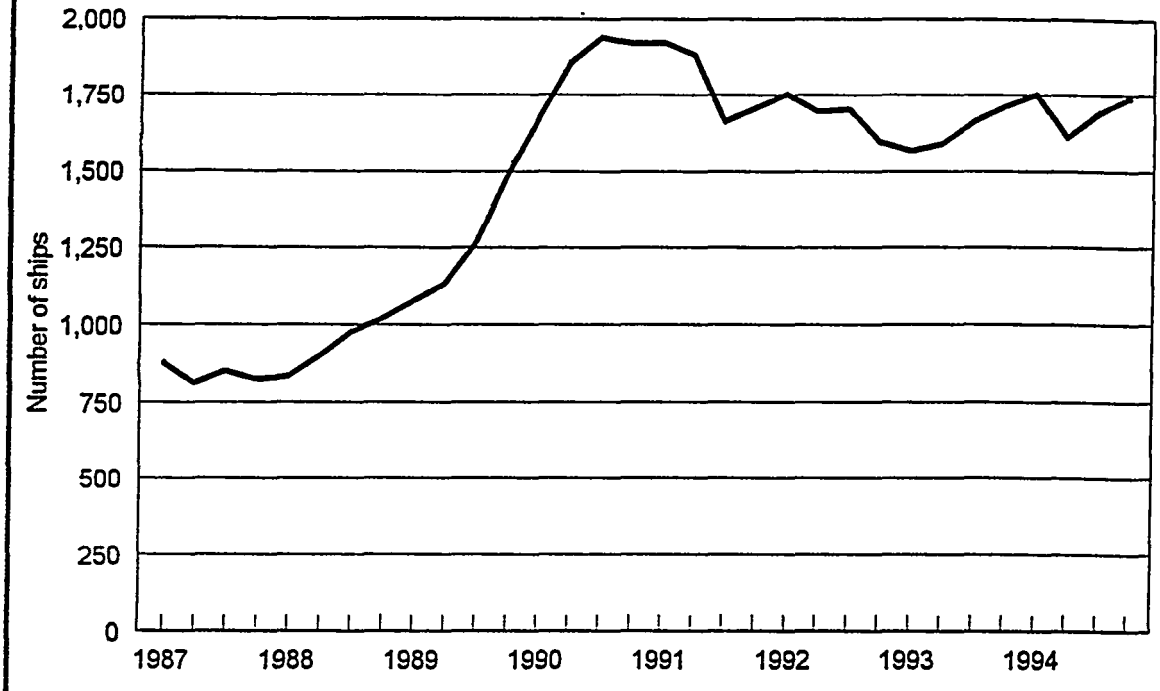

Figure 3.6 : DWT ON ORDER BY MARKET LEADERS

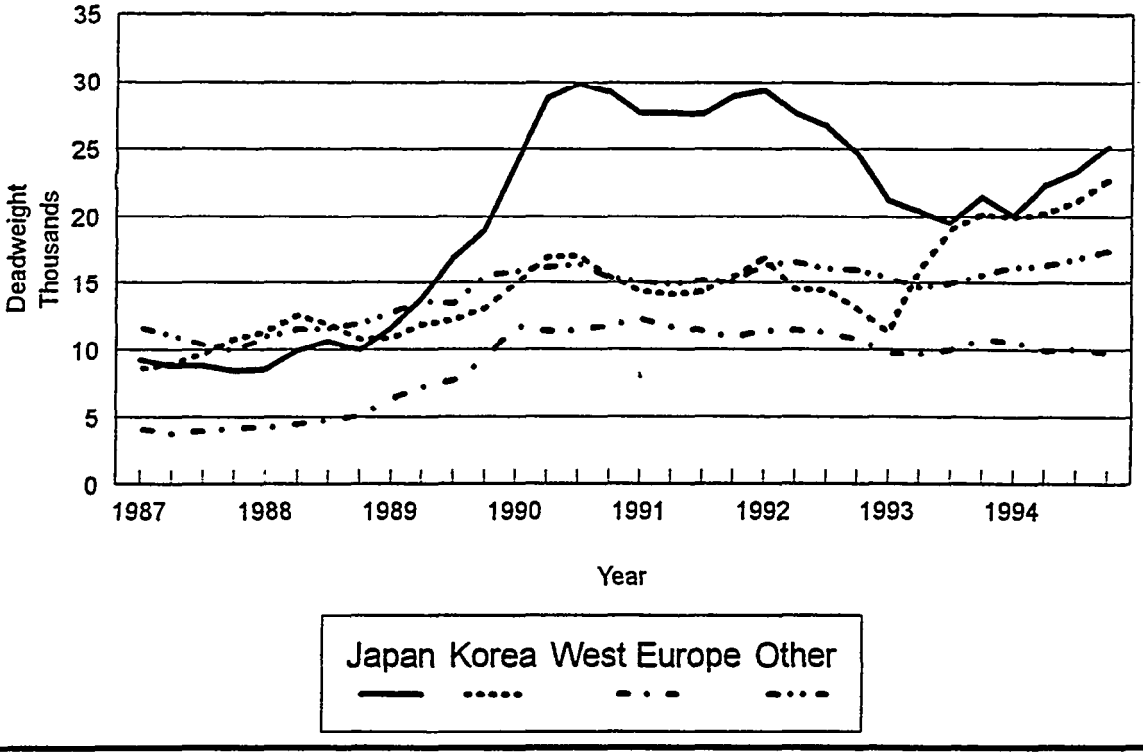

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Figure 3.7 : SHIPS ON ORDER BY MARKET LEADERS

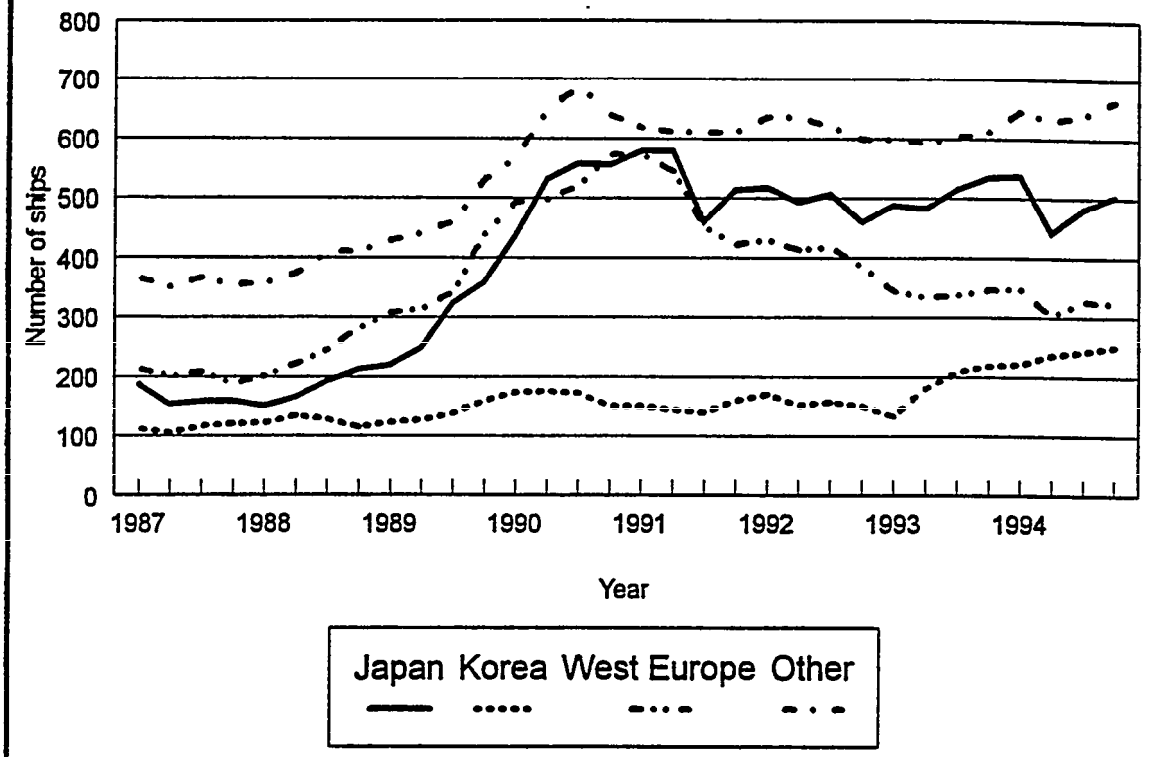

Figure 3.8: FREIGHT RATE INDEX

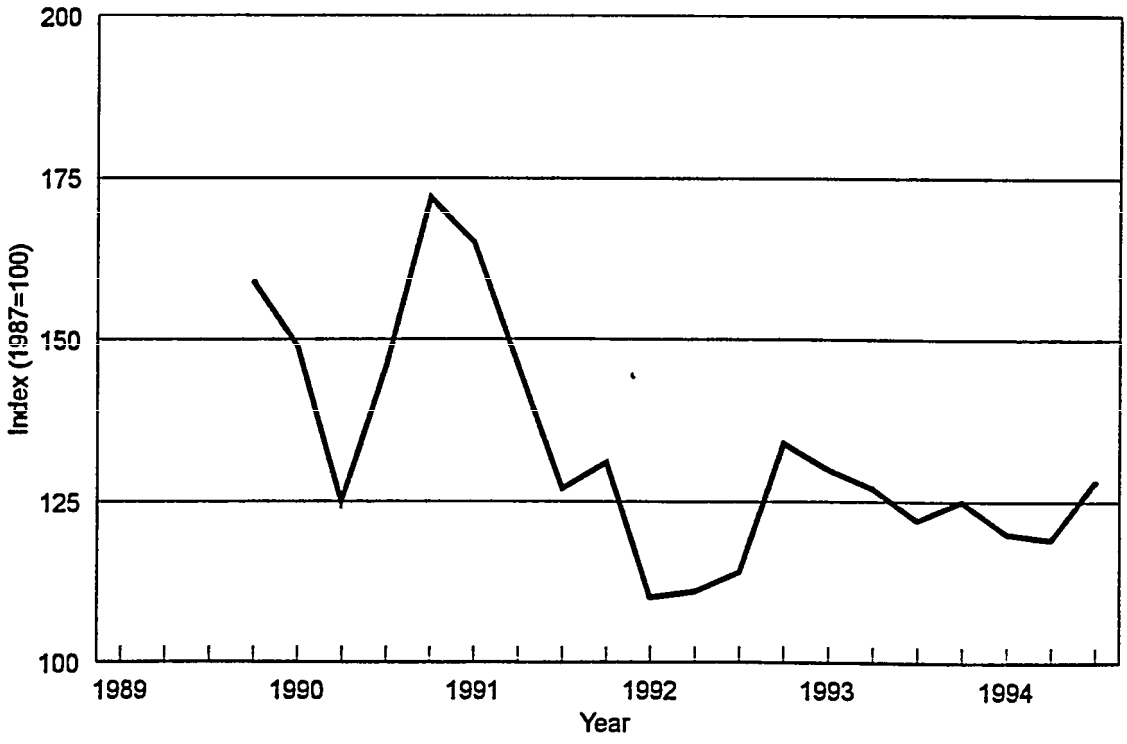

Figure 3.9 : BULKER SURPLUS TONNAGE

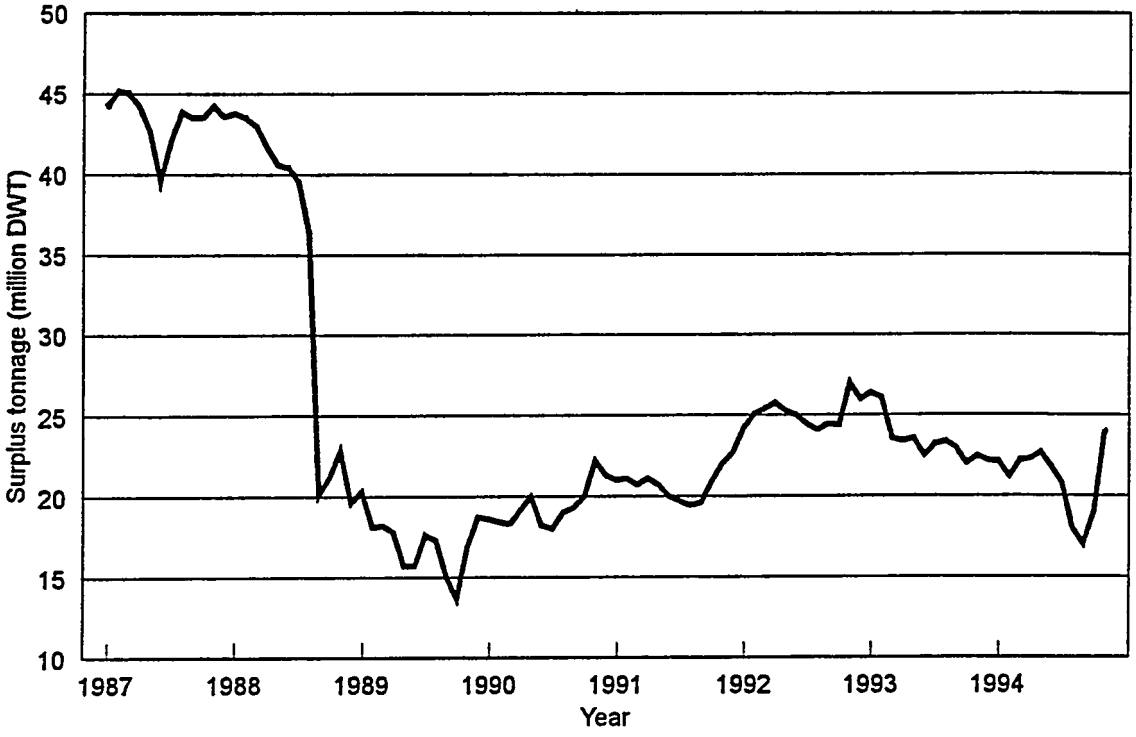

Figure 3.10 : TANKER SURPLUS TONNAGE

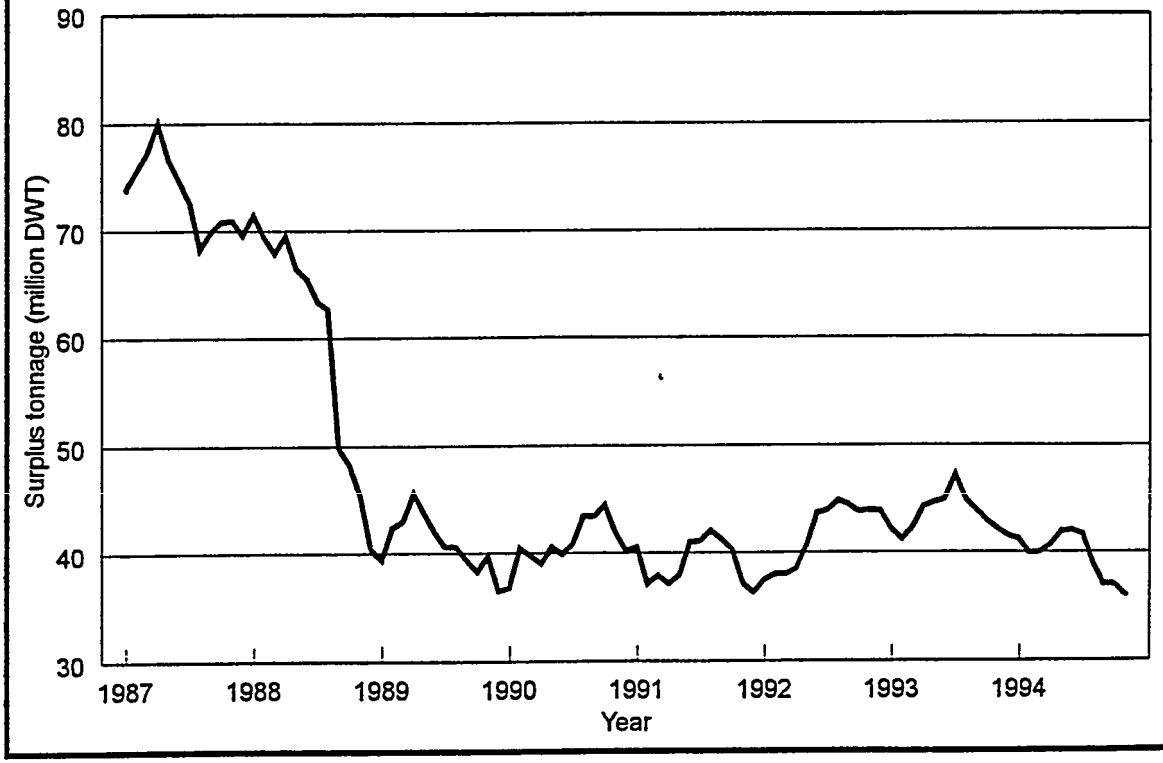

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Figure 3.11 :DEMAND FOR SPECIAL SURVEYS

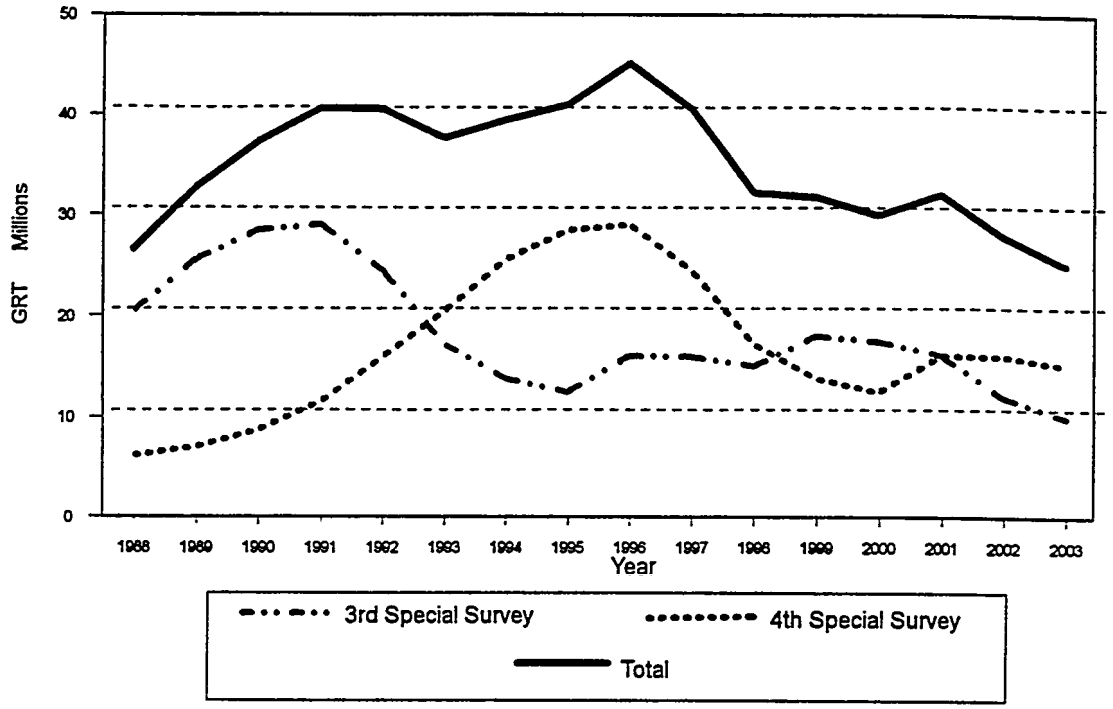
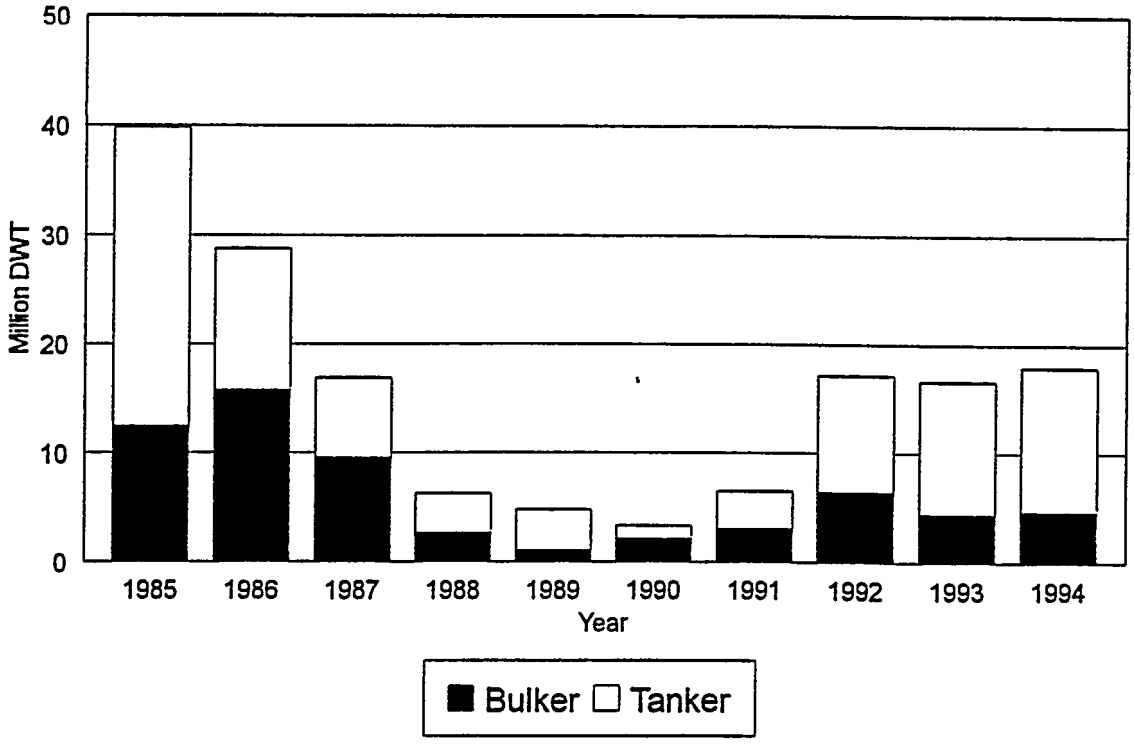


Figure 3.12 : SCRAPPED TONNAGE 1985 - 1994



4. METHODOLOGY

The shipbuilding industry system and the way that it interacts with the shipping industry, is presented in a simplified format in Figure 4.1.

There are two primary determinants of shipbuilding demand. Firstly, as the demand for world trade expands, so the capacity of the fleet must expand to facilitate this. The fleet is regulated by surplus capacity, and the balance between supply and demand in the shipping sector determines the level of freight rates, which have a direct and material effect on the owner's decision to build, or conversely his decision to scrap. It should be noted that the decision to scrap and the decision to build are not directly linked, and there may be a lag between the two as the system changes. The fleet is flexible, and increasing demand at this time can be accommodated by reducing surpluses, although ultimately if trade is to expand the fleet must also.

Secondly, demand for new ships will be generated by the scrapping of obsolete capacity that will be replaced, unless the fleet needs to shrink : not an un-precedented scenario.

These two factors have been modeled to produce the basic demand forecast, based on the existing fleet. Age profiles and likely scrapping age have been analyzed, along with future trade prospects and the potential for growth, taking into account the fleet balance.

In addition to this, the state of development of the fleet sector concerned must also be taken into account. High rates of growth will be seen during the development phase of a particular sector, as has been seen recently with large cruise ships, for example. This is basically the analysis of product life cycles, and the vitally important implications of this are explained in detail in the following sections.

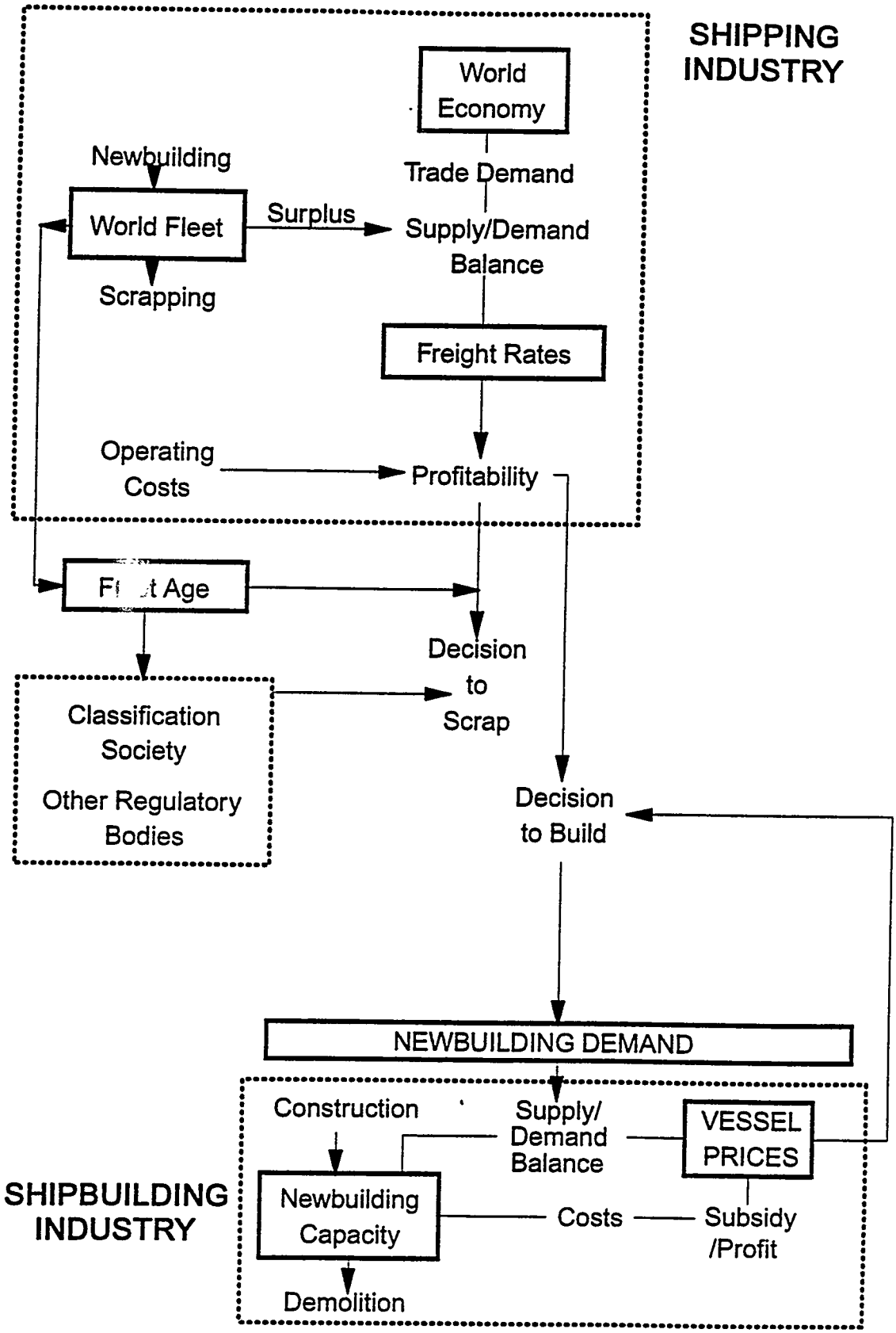


Figure 4.1 Market Drivers and Key Determinants

5. FLEET STATISTICS AND FLEET DEVELOPMENT

5.1 FLEET DEVELOPMENT

In general terms, any sector of the fleet will expand to accommodate growth in trade. There is generally a surplus of tonnage to provide elasticity in the system and the lower the level of surplus the more directly trade growth translates into new ships.

There is a further aspect of fleet development however, that has a strong and direct effect on fleet growth rates. As with any product, shiptypes proceed through a product life cycle, with three main distinct phases:

- Growth
- Maturity
- Decline.

The characteristics of three phases in terms of growth are as follows:

- Growth : High growth rates (typically around 8% per annum) as the fleet is established. The development of new shiptypes, such as container ships, is a good example.

- Maturity : Low growth rates, (typically around 2.5% or below) responding to trade variation. Negative growth rates are also possible during this period, in response to excess surplus tonnage, as was seen in the tanker fleet in the 1980s.

- Decline : Sustained negative growth rates, the best current example being the general cargo fleet built up in the 1970s, the function of which is being overtaken by containerization. This fleet has been declining for some years.

It is clearly important to be able to identify where in the cycle the fleet sector is and as importantly when the changes may occur from one phase to another: predicting this is the key to utilizing life cycle diagrams as a management tool.

Lloyd's Register data has been utilized to examine the development of each fleet sector, to identify at which point of development each lies.

5.2 FLEET OVERVIEW

5.2.1 Historical Development

- Figure 5.1 illustrates how the world fleet of ships has varied over the last 25 years.

- During the period 1970 until 1982 the world fleet grew from 207 million gross tonnes to 425 million, a rise of 87%. This continual, steady rise in capacity over the period was for the most part due to the massive increases in tanker tonnage, which in turn was driven by the high price of oil over the same time period.

- The oil crisis at the beginning of the 1980s precipitated a chain of events that had a major impact on the marine and shipping industry. Almost overnight freight rates plummeted as shipping demand dropped. The surplus of tonnage meant that world fleet development halted and then began to fall. From a peak of 425 million gross tonnes in 1982 the world fleet shrunk to 403 million in 1988, a fall of 5%.

- At the end of the 1980s, a decade of financial loss, there was a solid feeling amongst shipping investors that the need for the replacement of the aging 1970s built fleet would create newbuilding demand. As a consequence, a number of investors anticipating this demand ordered the building of new ships believing that early entry back into the market, particularly tankers, would result in high profits. As a result world fleet development rose from the trough of 403 million gross tonnes in 1988 to a new high of 444 million in 1992, a rise of 10%.

- At present, the replacement of the bulk fleet (dry and liquid) is gathering momentum, deliveries are up and scrapping is proceeding. However, the problem is freight rates. The continued existence of much of the 1970's fleet, combined with the increased new deliveries has driven freight rates lower, although dry cargo rates are currently increasing strongly.

5.2.2 Current World Fleet

- Figure 5.2 illustrates the distribution of the world fleet according to ship type. The fleet is dominated by bulk carriers and general cargo ships, each representing a 25% share, together making up over half of the world fleet over 5,000 dwt.

- Tankers and special tankers make up a further 20% of the fleet, with container ships, ro-ros, passenger ships and ferries each taking approximately a 6% slice.

- Remaining sectors (passenger, reefer, OBO, gas carriers and vehicle carriers) are very small.

- Figure 5.3 illustrates the distribution of the world fleet according to owner nationality. Japanese and Greek owners predominate, together representing quarter of the market. China and the USA come next, each taking 6% of the market. The next group of nationalities taking a significant slice of the market are Norway, Russia, Germany and Hong Kong, each taking between 3% and 4%.

- The UK, Denmark, Italy, South Korea and Singapore represent the final group of owner nationalities representing a significant portion of the market, with market shares varying between 1% and 2%.

The nationality of ships is important. As will be discussed in the later section on competition, many nationalities show strong tendencies towards domestic ordering. In particular, most Japanese ships are built in home shipyards (although a small number have recently been ordered in South Korea) and much of North West Europe shows strong domestic ordering patterns.

Figure 5.1 : WORLD FLEET DEVELOPMENT (1970-1994)

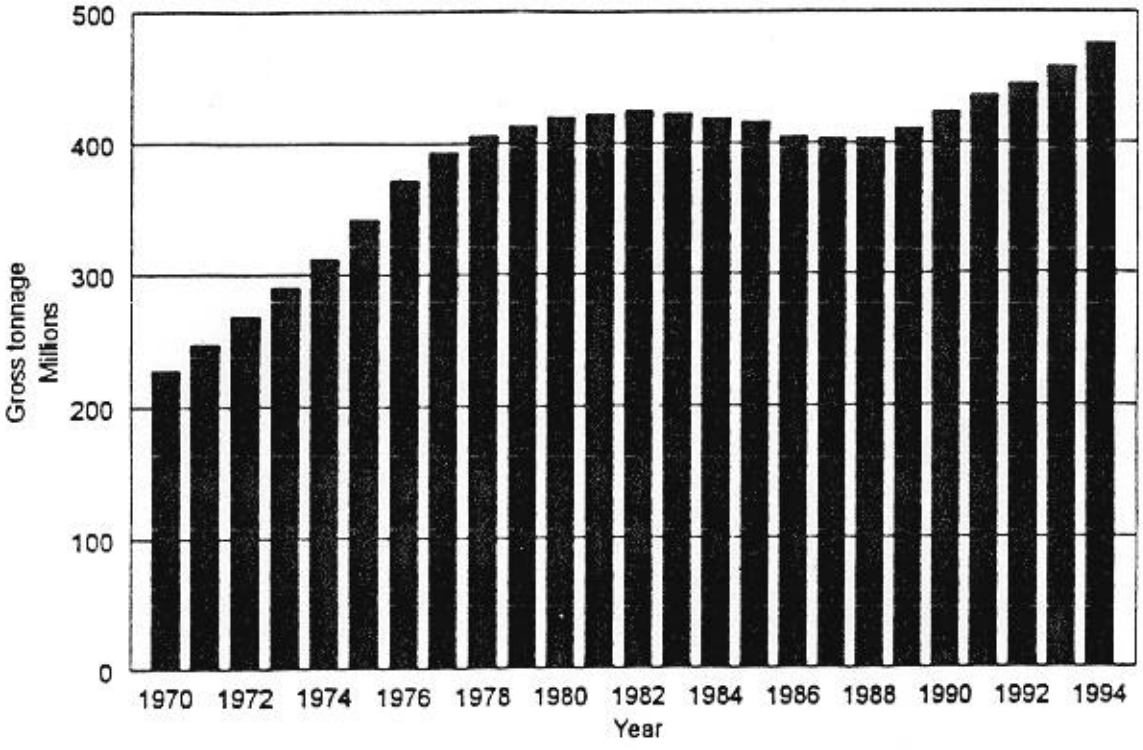


Figure 5.2 :WORLD FLEET - DISTRIBUTION BY TYPE

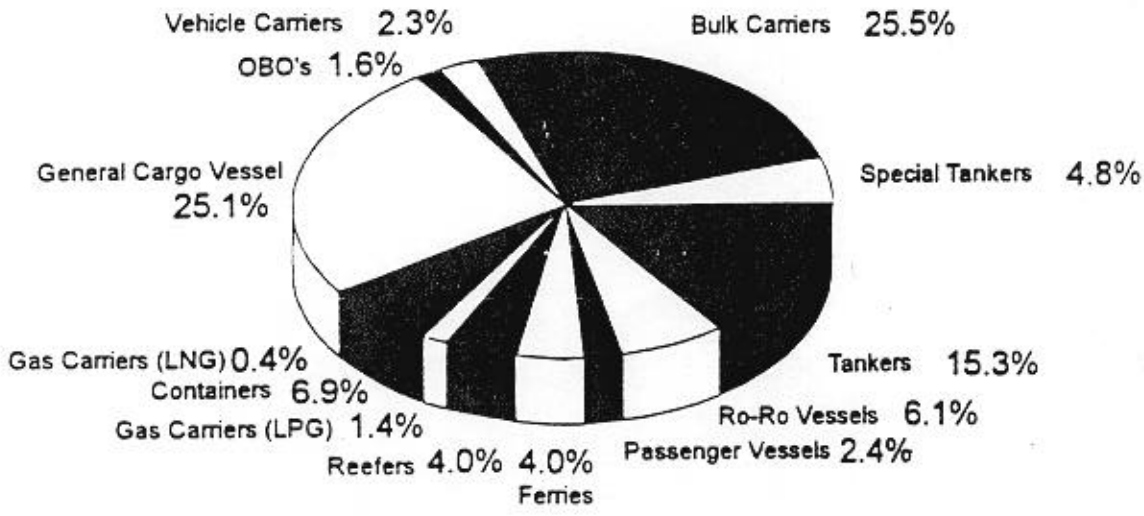
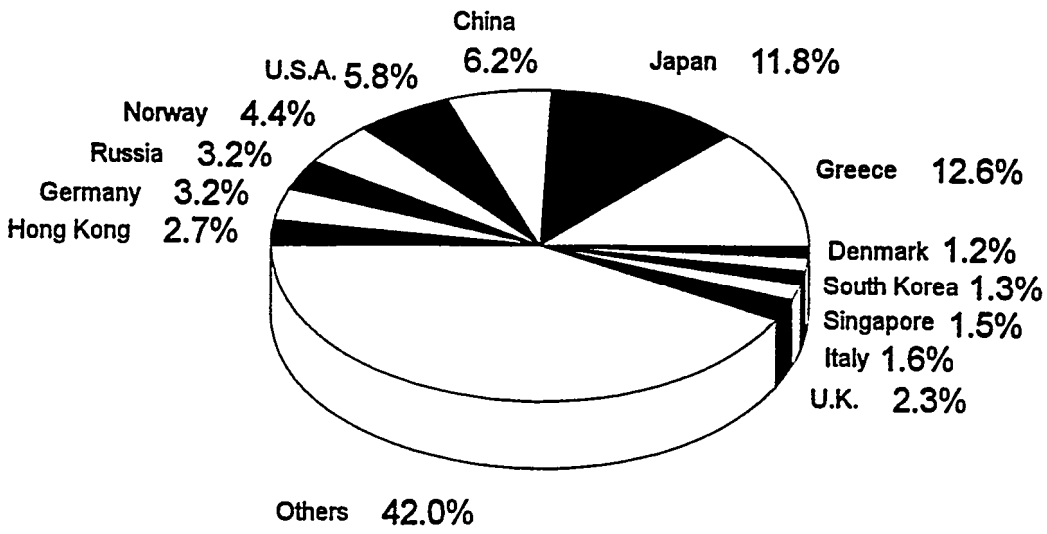


Figure 5.3 : WORLD FLEET - DISTRIBUTION BY OWNER



5.3 THE TANKER FLEET

- Figures 5.4a to 5.4f illustrate details of the current tanker fleet.

- The tanker fleet above 5,000 dwt numbers 3,009 ships and is the third largest sector of the fleet following bulk carriers and general cargo ships.

Ž The average age is high, at 16 years. The age is at a similar level across all sectors of the fleet except the panamax sector, where the average age is slightly lower at 13 years.

Dwt	Average Age
5,000-20,000	16
20,000-50,000	17
50,000-100,000	13
100,000-200,000	16
200,000+	17

Ž The distribution of ships across the size bands is as follows:

Dwt	Number of Ships
5,000-20,000	733
20,000-50,000	852
50,000-100,000	675
100,000-200,000	326
200,000+	423

The largest sector in terms of numbers is the handysize fleet, with 852 ships, but in terms of capacity the larger ship sizes above 100,000 dwt dominate.

- There has been no significant change in size preference in recent years, although panamax and handysize ships have become somewhat larger. Average size for panamax delivered between 1989 and 1993 was 86,350 dwt and for handysize 38,500 dwt. Arguably the most popular size in the handysize range is now what has become known as handymax, between around 40,000 and 45,000 dwt.

Ž Deliveries of tankers peaked in the mid 1970s, with 292 vessels delivered in 1975. Deliveries have been building up in recent years, as follows:

Year	Number of Vessels Delivered
1989	93
1990	83
1991	101
1992	126
1993	139

Ž There are currently 399 tankers on order above 5,000 dwt and the order book has been declining since a peak seen in 1991. There is some evidence that recent deliveries, without an adequate increase in scrapping, has lead to an increase in surplus, suppressing freight rates and lowering demand.

Ž The oil tanker fleet went through the development phase between about 1966 and 1976. By 1976, a large surplus had been developed in the fleet and between 1980 and 1986 the fleet declined by around 30%. Since that point the tanker fleet has been in a mature phase, growing moderately in response to increasing demand.

- The average rates of growth in the five years up to the end of 1992 was 2.28% in terms of gross tonnes and 1.06% in terms of numbers. The larger sectors of the fleet are growing faster than the smaller sectors, and the estimated average annual growth rates at this time areas follows:

Dwt	**Estimated Average Annual Growth Rate**
5,000-20,000	0.66%
20,000-50,000	0.66%
50,000-100,000	1%
100,000-200,000	1.55%
200,000+	1.27%

- The nationality of ownership of the tanker fleet is widely spread and much of the market is therefore likely to be open in competitive terms. The dominance of Japanese ownership is less marked than other fleet sectors, and the USA (including Jones Act tonnages) is the largest single owner (13.9%). Of the USA owned fleet, there are 178 vessels registered as US flag with an additional 219 USA owned ships registered elsewhere.

Figure 5.4a : CURRENT FLEET - TANKER

DISTRIBUTION BY NUMBER OF SHIPS

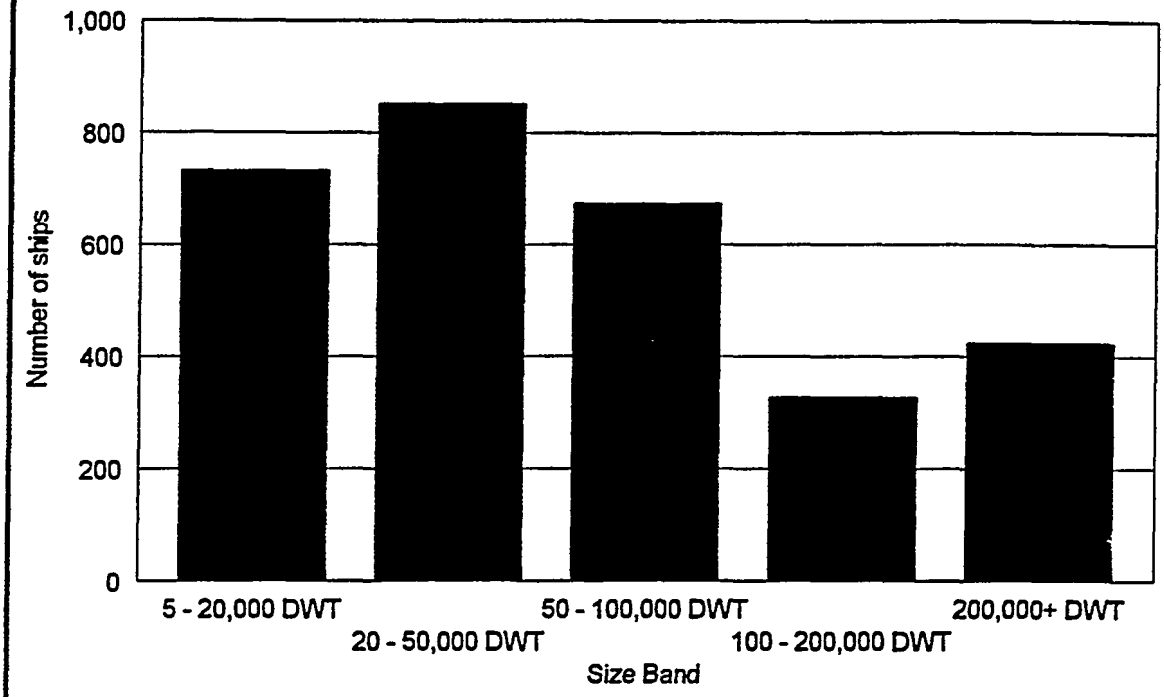


Figure 5.4b : CURRENT FLEET - TANKER

DISTRIBUTION BY GROSS TONNAGE

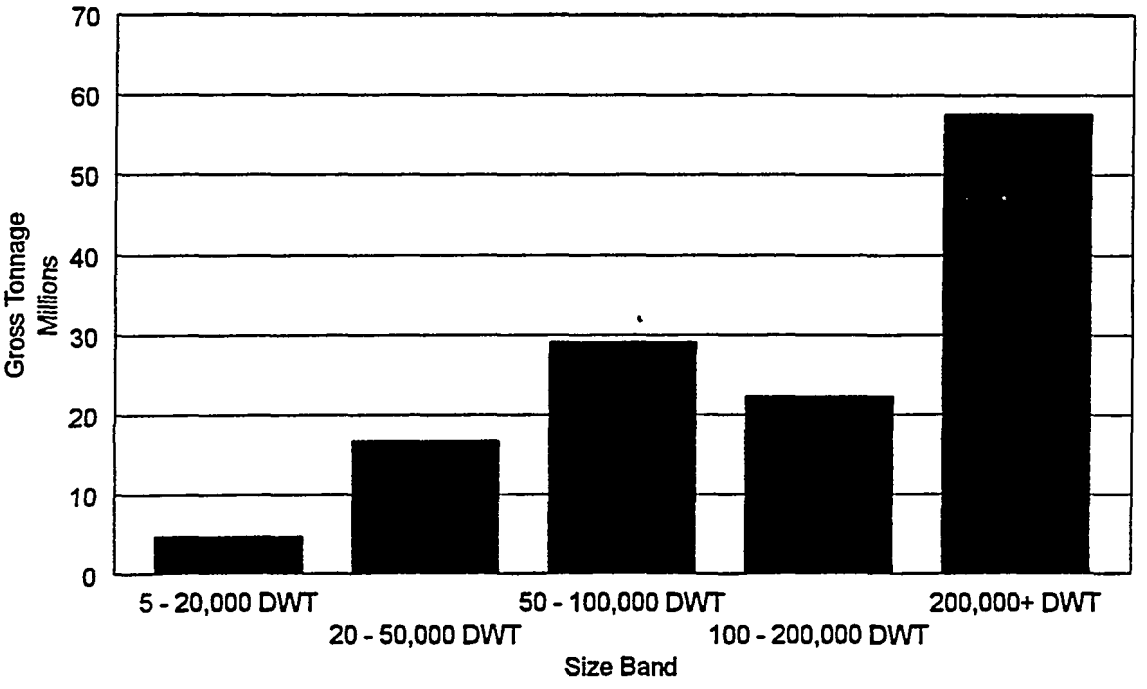


Figure 5.4c : FLEET DEVELOPMENT - OIL TANKER

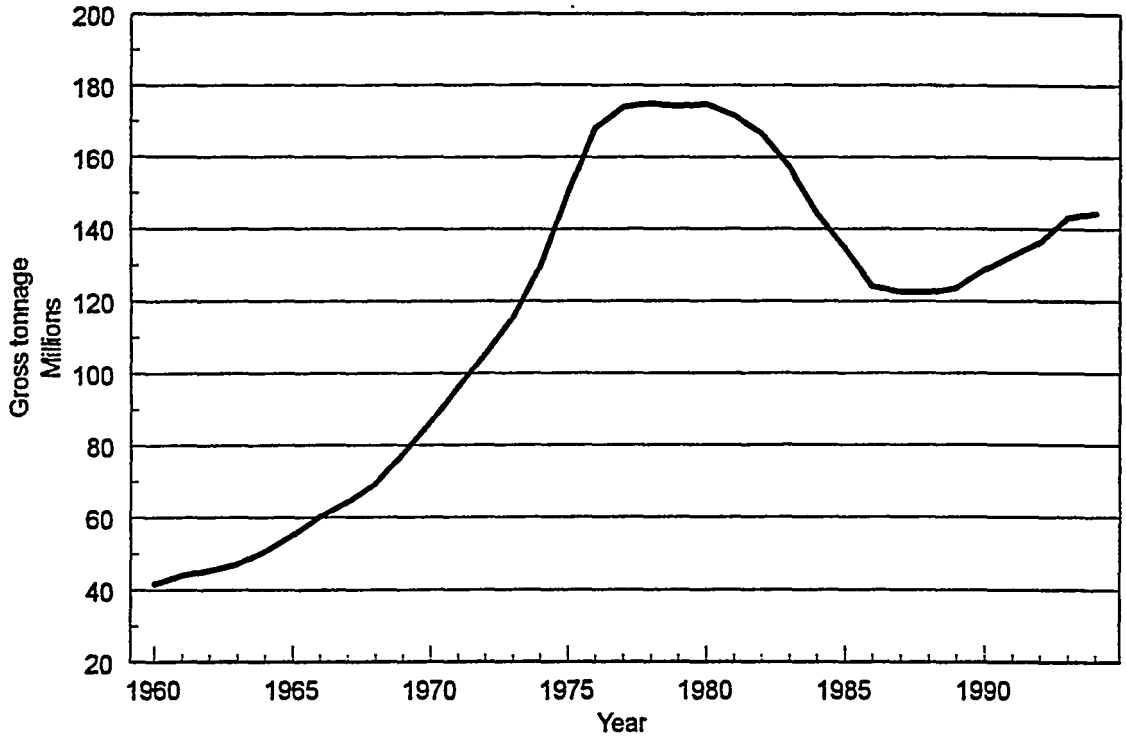


Figure 5.4d : DISTRIBUTION BY AGE - OIL TANKER

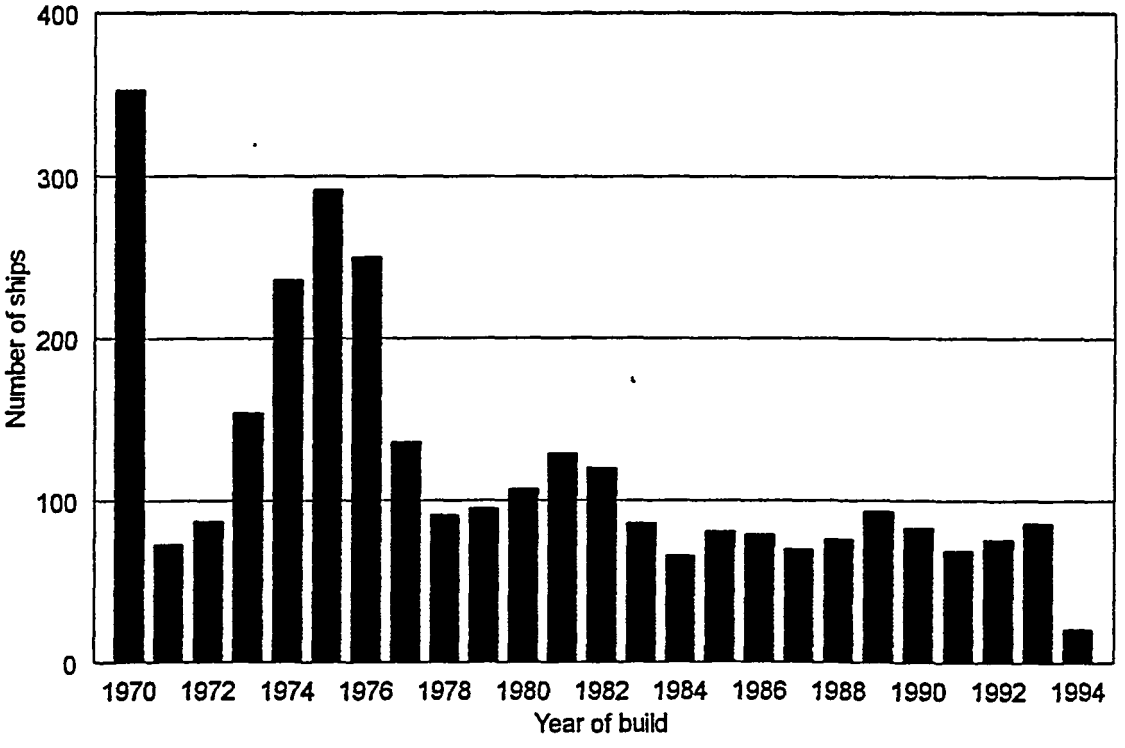


Figure 5.4e : OWNER NATIONALITY - OIL TANKER

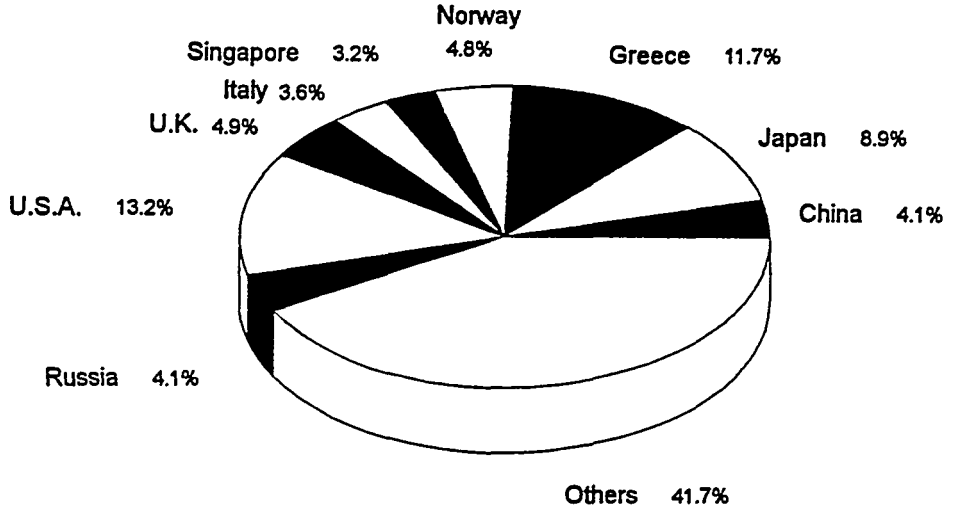
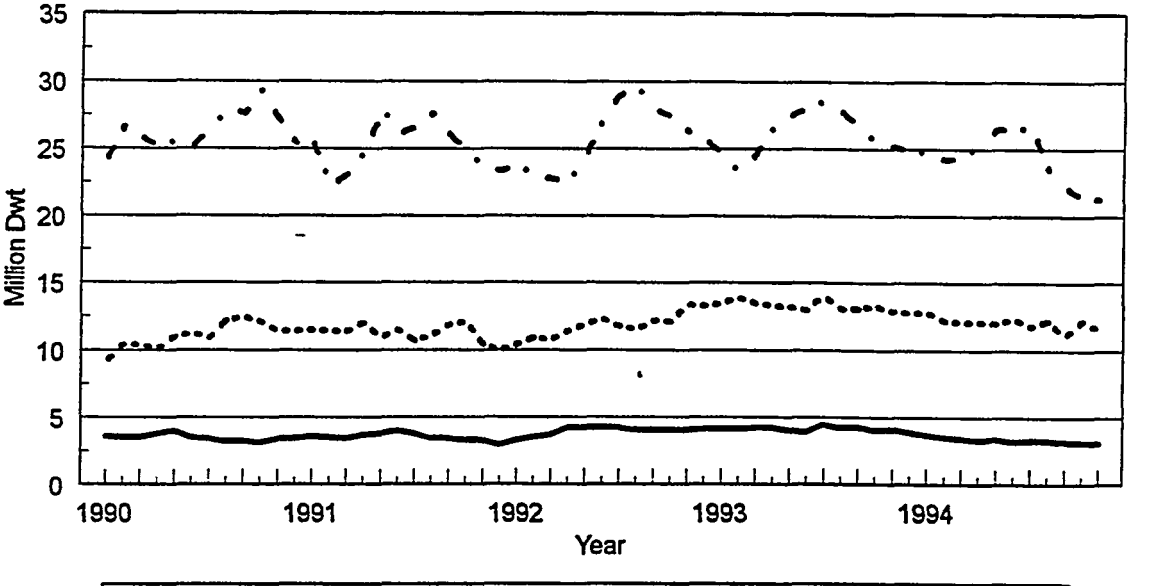


Figure 5.4f :TANKERS TOTAL SURPLUS



Source :Lloyds Shipping Economist

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5.4 CHEMICAL TANKERS

- Figure 5,5a to 5.5e illustrate details of the current chemical tanker fleet.
- The chemical tanker fleet above 5,000 dwt numbers 946 ships.
- The size of ships is fairly evenly spread up to 50,000 dwt, but with only a small fleet above that size:

Dwt	Number of Vessels
5,000-10,000	397
10,000-20,000	182
30,000-50,000	295
50,000+	74

Ž The average age of the fleet is low, at 12 years overall, and varies only slightly between all sectors of the fleet, as follows.

Dwt	Number of Vessels
5,000-10,000	11
10,000-20,000	10
30,000-50,000	13
50,000+	13

Ž The peak of newbuilding was seen in this sector between 1981 and 1985 with 75 ships delivered in the peak year, 1985. The level of ordering has been significantly lower since that time, but with a secondary peak of 50 vessels delivered in 1992.

- The fleet developed strongly with high growth in the 1970s and 1980s, but some slowing down has been seen since the mid 1980s. The average rate in the five years up to the end of 1992 was 4.77%. Growth has been significantly higher for ships under 20,000 dwt, as indicated by the estimated growth rates for ships delivered in the five years up to 1993:

Dwt	Estimated Annual Average Growth
5,000-10,000	4.0%
10,000-20,000	4.6%
20,000-50,000	2.5%
50,000+	2.5%

- The demand for chemical tankers is particularly sensitive to general global economic performance. In response to high economic growth in the 1980s the order book developed strongly, reaching a level of most 100 ships on order in 1992. Following the global recession this has fallen to a steady level of around 60 ships on order. This is likely to be more indicative of future levels and it is likely that more moderate growth rates will be seen in the future.

- In general terms the ownership of chemical tankers in concentrated in more highly developed countries, in particular:

Japan	:	14%
North West Europe	:	48.4%
USA	:	4.5%

Norwegian owners dominate with 19.5% of the fleet, with Japan in second place. Of the USA owned fleet, there are 18 ships registered as USA flag, whilst the remaining 24 vessels are registered outside the country.

Figure 5.5a : CURRENT FLEET - CHEMICAL TANKER
DISTRIBUTION BY NUMBER OF SHIPS

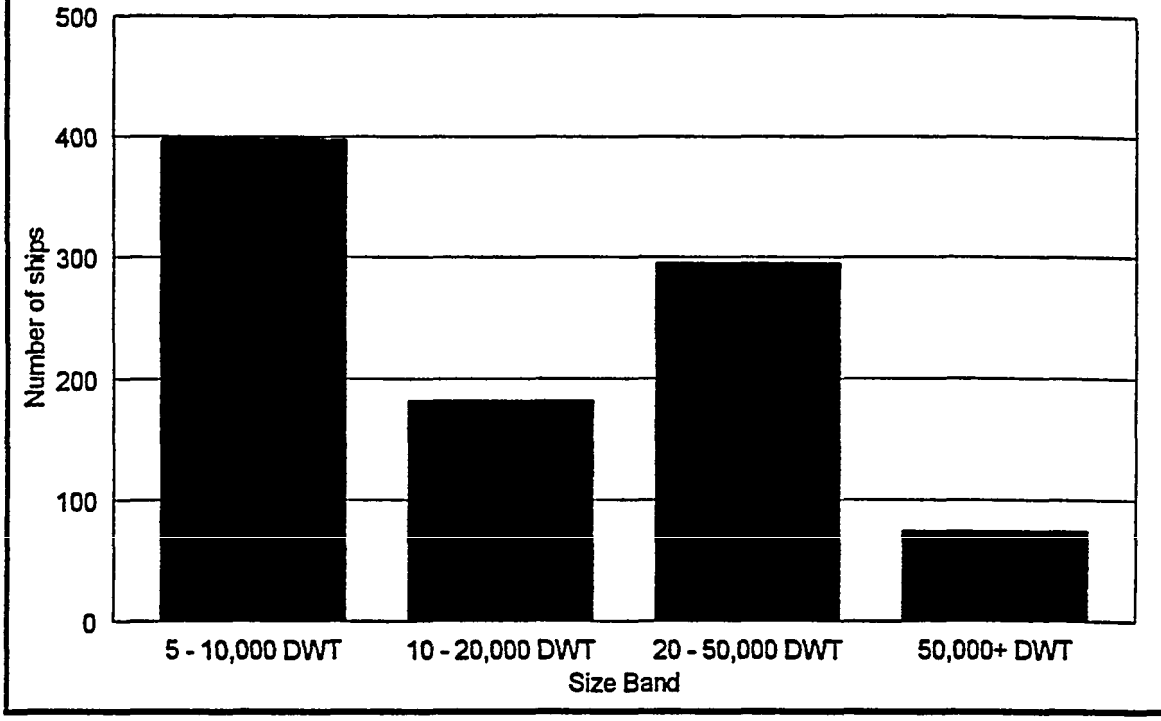

Figure 5.5b : CURRENT FLEET- CHEMICAL TANKER
DISTRIBUTION BY GROSS TONNAGE

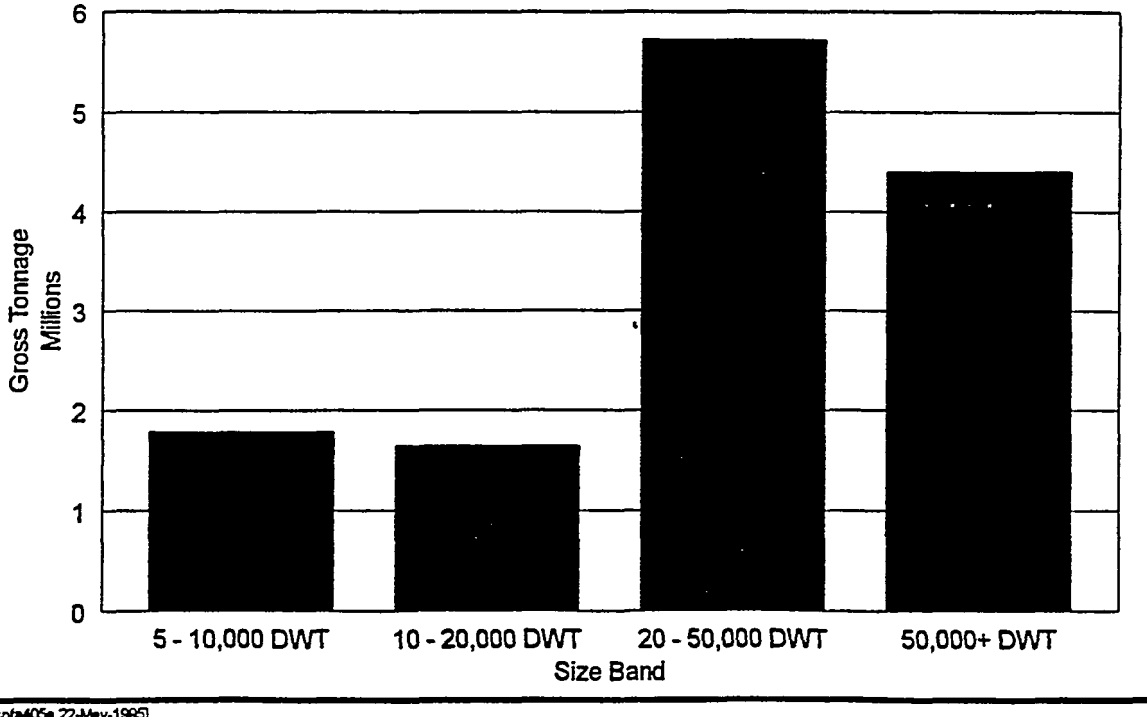

Figure 5.5c : FLEET DEVELOPMENT - CHEMICAL TANKER

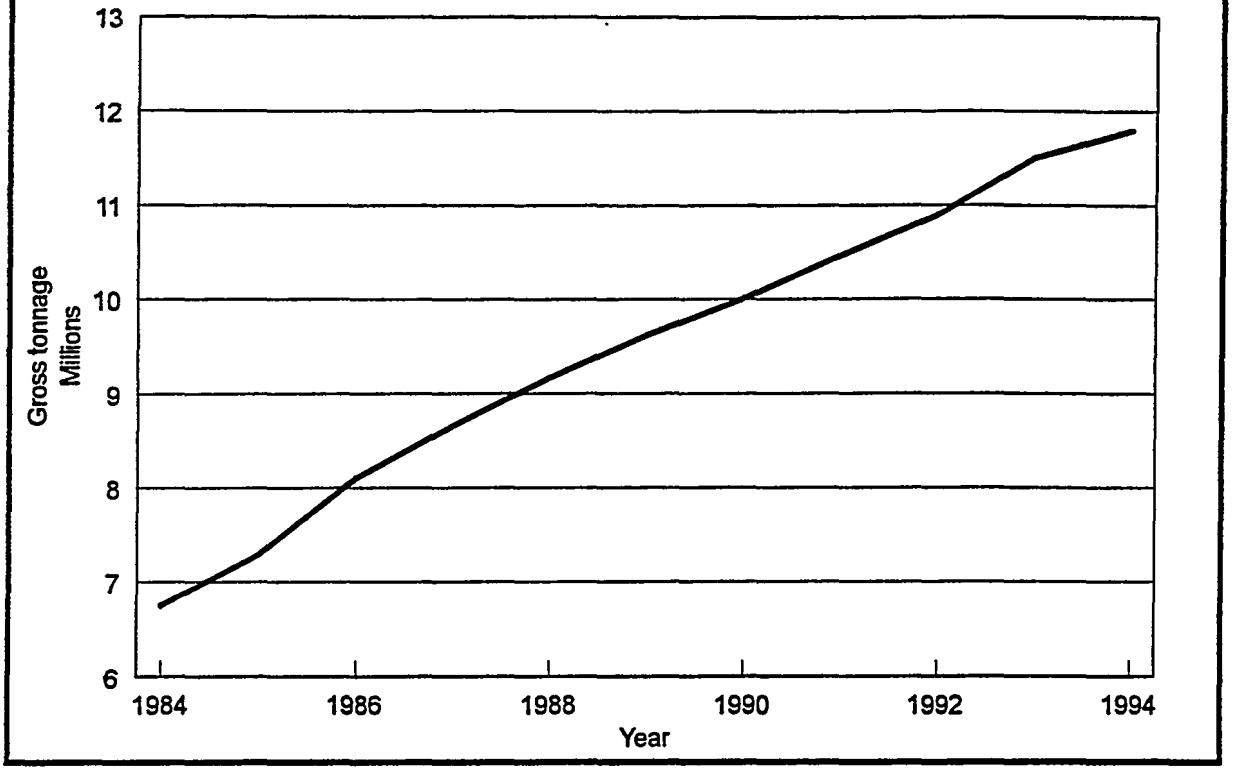

Figure 5.5d : DISTRIBUTION BY AGE - CHEMICAL TANKER

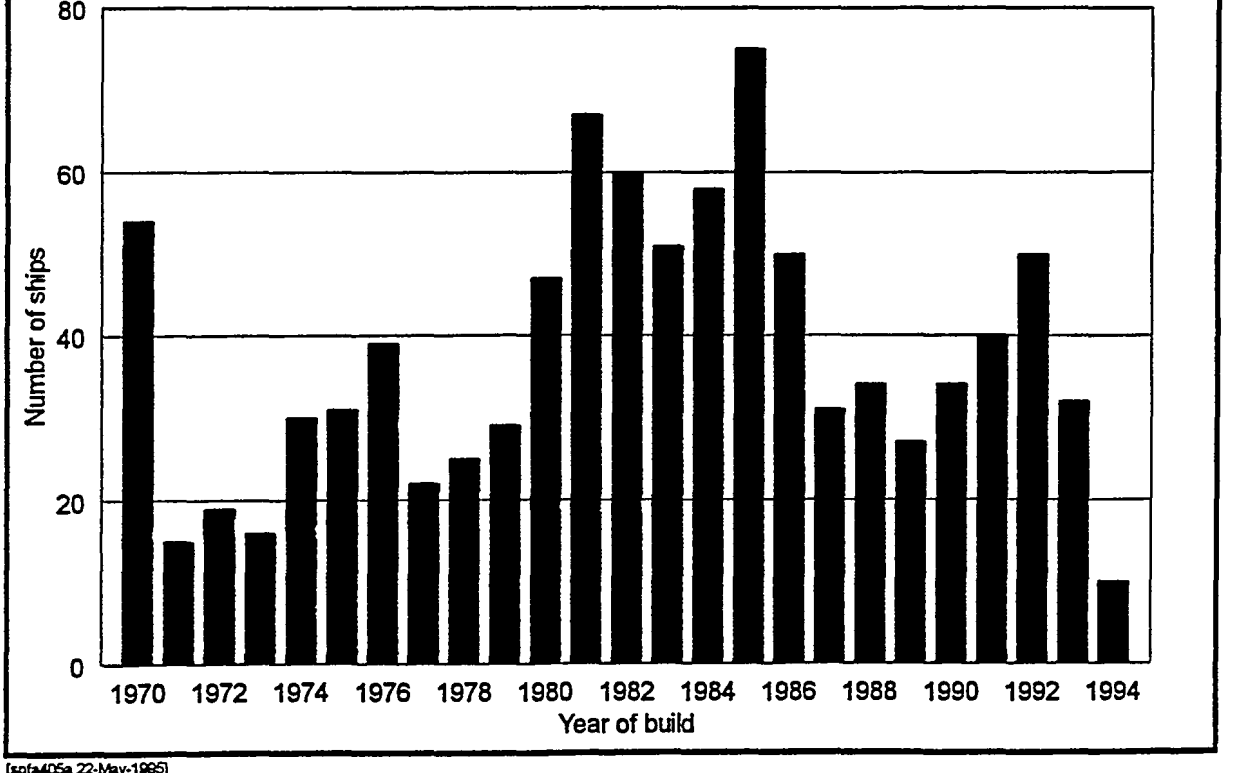

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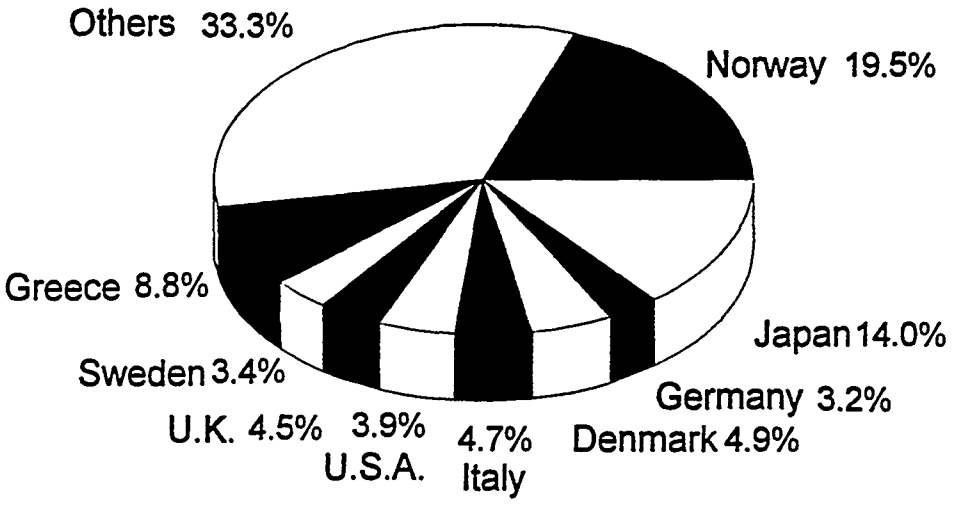
Figure 5.5e : OWNER NATIONALITY - CHEMICAL TANKER



5.5 BULK CARRIERS

- Figures 5.6a - 5.6f illustrate details of the current bulk carrier fleet.

Ž The total bulk carrier fleet above 5,000 dwt numbers 5,017 ships and this is the largest sector of the fleet as a whole.

Ž The fleet is old with an average age of 15 years. The average age varies by sector as follows:

Dwt	Average Age
5,000 to 20,000	18
20,000 to 50,000	15
50,000 to 90,000	12
90,000 to 200,000	13
200,000+	7

The VLBC sector (over 200,000 dwt) is young, but is also small at only 30 ships in total.

Ž The fleet is dominated by the handysize sector, alone accounting for 57.5% of all bulk carriers. This size remains the most popular, although the average vessel size within this band is increasing to some extent, with the introduction of the 'Handymax' class of vessels between around 40,000 and 45,000 dwt.

Ž The distribution of the fleet between the size bands is as follows:

Dwt	Number of Ships
5,000 to 20,000	908
20,000 to 50,000	2,889
50,000 to 90,000	880
90,000 to 200,000	312
200,000+	30

Ž There have been two peaks of newbuildings for bulk carriers, between 1976 and 1978, with 379 ships delivered in the peak year 1977, and between 1981 and 1986, with 369 ships delivered in 1984. The early 1990s saw a drop in deliveries, to a low of 55 ships delivered in 1992.

- The order book has increased strongly in the past three years from a low point of 156 orders in the final quarter of 1991 to 484 orders at the first quarter of 1995.

Ž The bulk carrier fleet developed strongly up to the mid 1980s, with the fleet achieving its current profile around 1986. The rate of growth slowed considerably at that time, as the fleet entered a mature phase. Growth rates over the past 5 years have been 0.82% in terms of numbers and 2. 11% in terms of gross tonnage.

Ž As with tankers, at this time the larger sectors of the fleet are growing slightly faster than lower sectors. The following statistics estimate growth rates over the last five years:

Dwt	**Growth Rate**
5,000-20,000	0.28%
20,000-50,000	0.48%
50,000-90,000	0.86%
90,000-200,000	1.07%
200,000+	1.27%

- The ownership profile of the bulk carrier fleet is widely spread, offering good export potential. Greece is the dominant owner, with 24.1% of the fleet, followed by Japan at 12.9% of the fleet. Beyond this, nationality is widely spread. Of the USA owned fleet, 18 ships are registered under the USA flag, whilst the remaining 158 owned vessels are registered elsewhere.

Figure 5.6a : CURRENT FLEET - BULKER

DISTRIBUTION BY NUMBER OF SHIPS

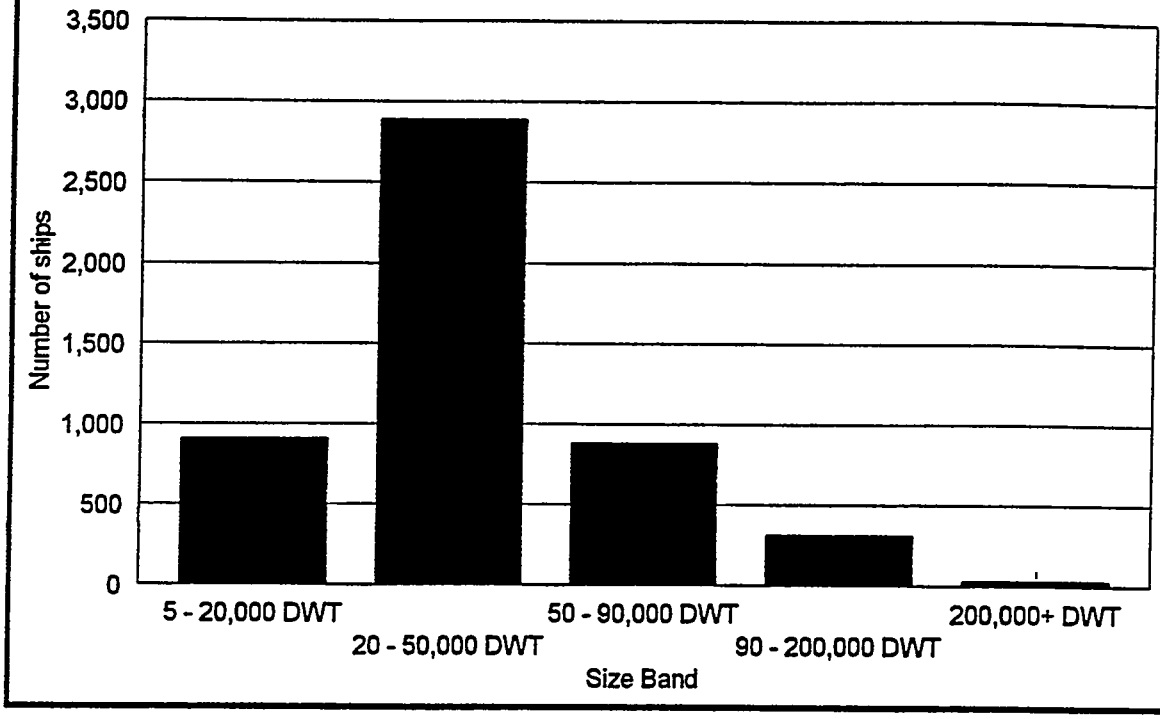


Figure 5.6b : CURRENT FLEET - BULKER

DISTRIBUTION BY GROSS TONNAGE

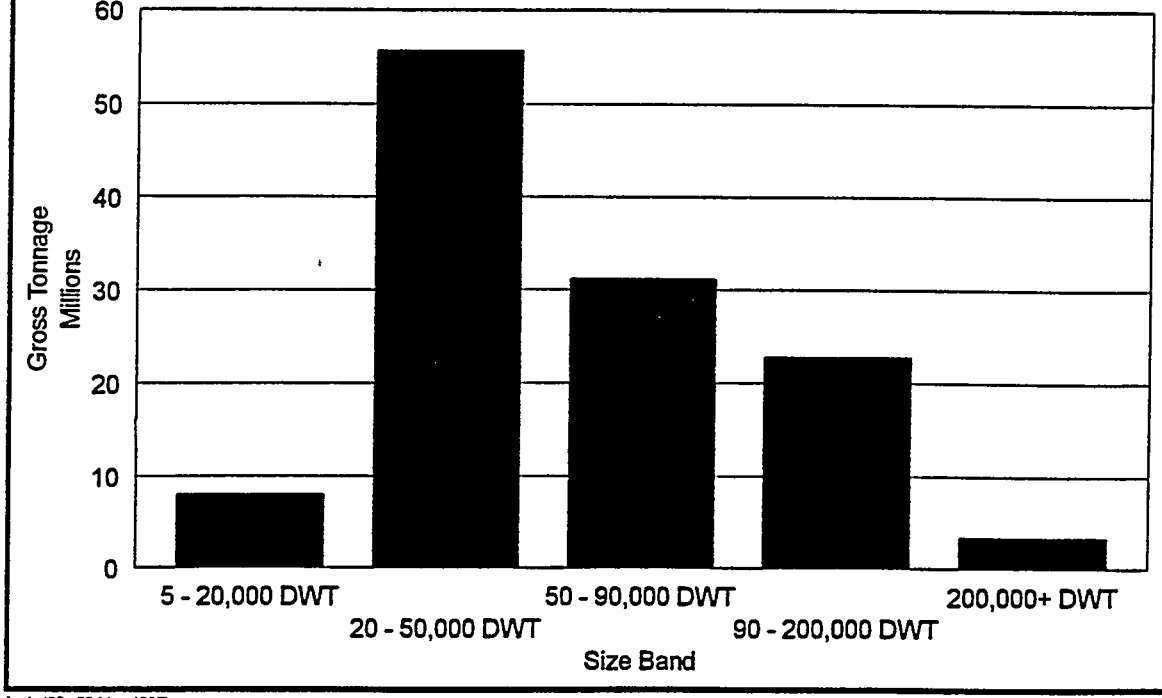


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Figure 5.6c : FLEET DEVELOPMENT - BULK CARRIER

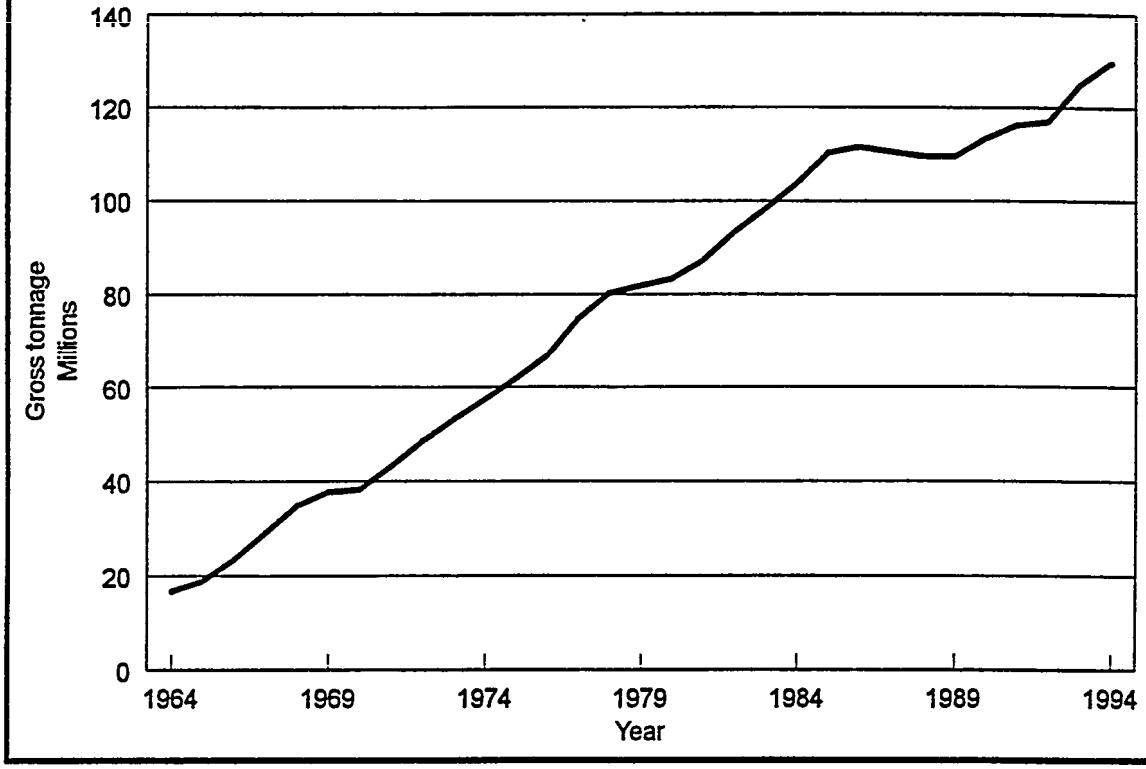


Figure 5.6d : DISTRIBUTION BY AGE - BULK CARRIER

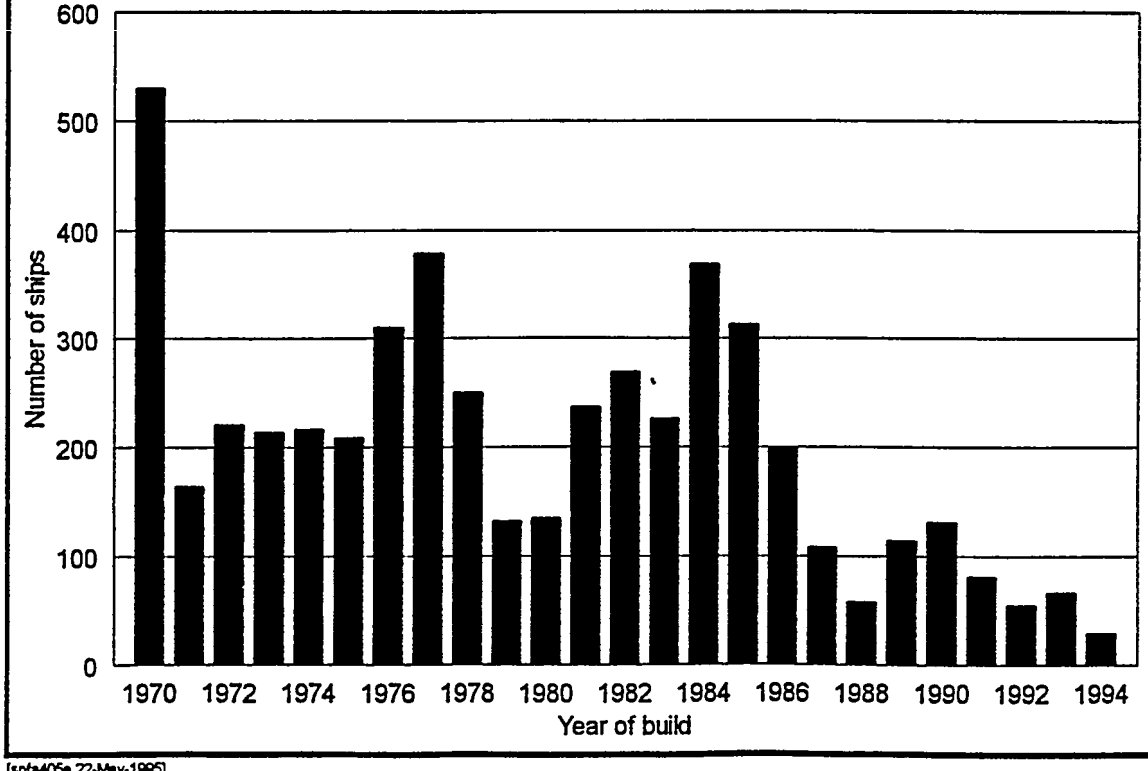


Figure 5.6e : OWNER NATIONALITY - BULK CARRIER

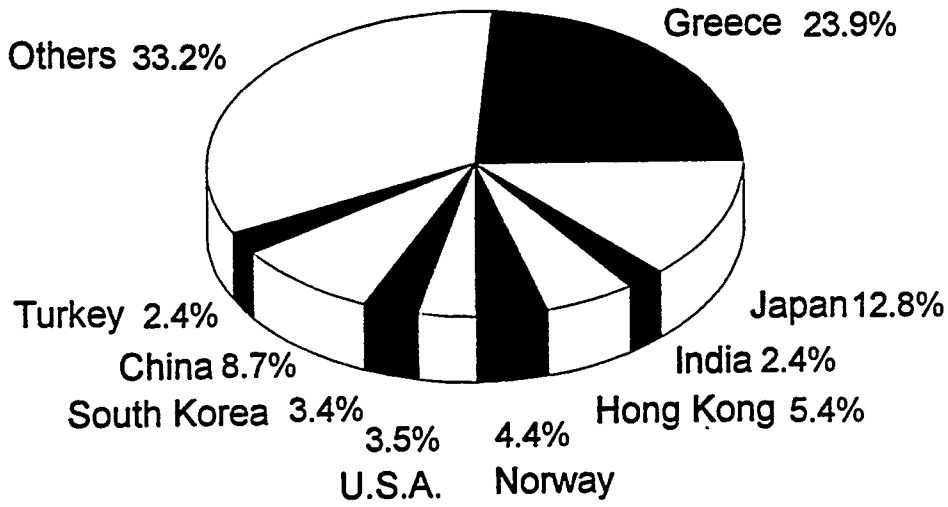
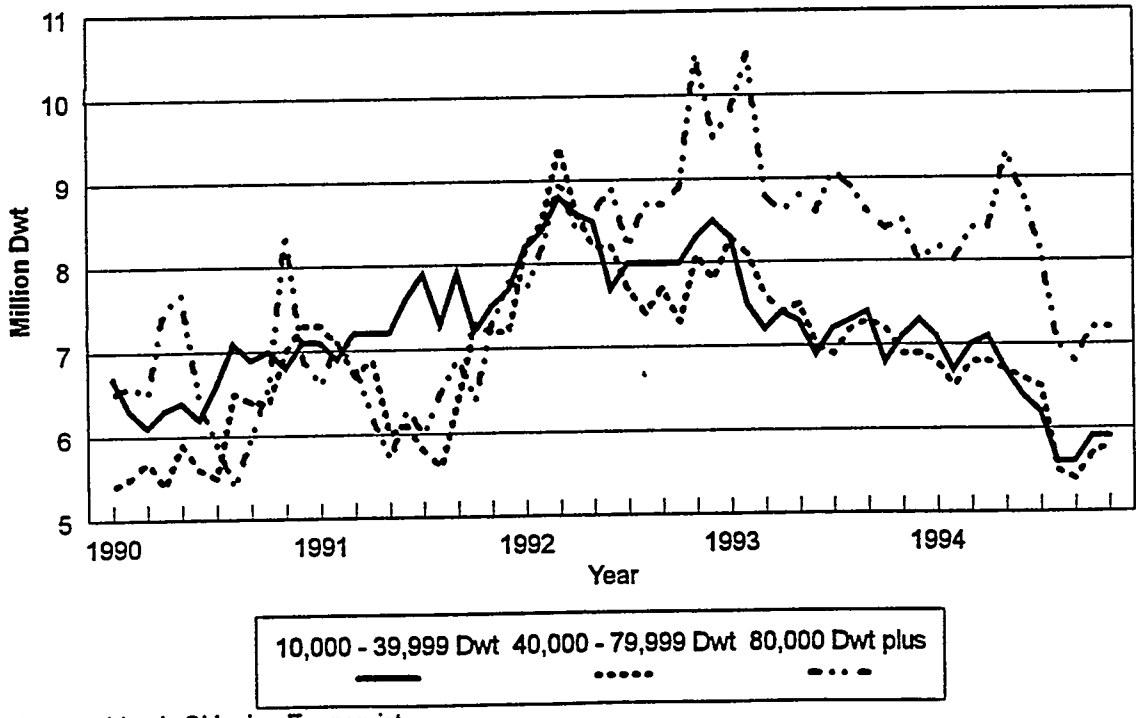


Figure 5.6f : BULK CARRIERS TOTAL SURPLUS



Source :Lloyds Shipping Economist

5.6 COMBINATION CARRIERS

- Figures 5.7a to 5.7f illustrate details of the current OBO fleet.

- The OBO fleet is one of the smaller fleet sectors, with 311 ships.

- The fleet is old, with an average age of 16 years. The fleet was mostly established in the 1970s with a peak of deliveries in 1973 with 38 ships. There was a lesser peak of deliveries in the early 1980s, but few have been built in general over the last decade. The order book currently stands at two ships only.

- The fleet is predominantly large, with 66% being cape size or above. The distribution is as follows:

Dwt	Number of Vessels
5,000-50,000	18
50,000-90,000	89
90,000-200,000	174
200,000+	30

- Few large OBOS have been built since the 1970s and the average age of the larger sector is particularly high, as follows:

Dwt	Average Age
5,000-50,000	10
50,000-90,000	14
90,000-200,000	18
200,000+	19

- The fleet declined through the 1980s although now appears to have stabilized. The decline over the past 10 years has been around 40%.

- There is some question as to whether the fleet will be replaced as older ships are scrapped. The likely situation will be one of continuing decline in this sector. The OBO fleet developed as an attempt at flexibility to maximize charter rates in the wet or dry sectors, depending on market conditions. The type became unpopular due to both safety problems, and the fact that charterers perceived that the shiptype was less than efficient in both cargo sectors (wet and dry).

- improved design has seen some improvement in the market, but this sector is likely to remain very much a niche market sector. The product life cycle of the OBO fleet exhibits the classic shape that is attributable to “fashion” (as does the tanker profile through the late 1970s and early 1980s). It remains to be seen whether or not OBOS will return to vogue. Some owners remain committed to the concept, but charterers are increasingly reluctant, although this could be related to the high age profile.

Ž The nationality of the OBO fleet is widely spread, with good opportunities for export. The largest concentrations of capacity are in Norway and Greece, which together account for 32.2% of the fleet. Of the **USA** owned fleet, 4 ships have US registration whilst the remaining 13 are registered elsewhere.

Figure 5.7a : CURRENT FLEET - OBO

DISTRIBUTION BY NUMBER OF SHIPS

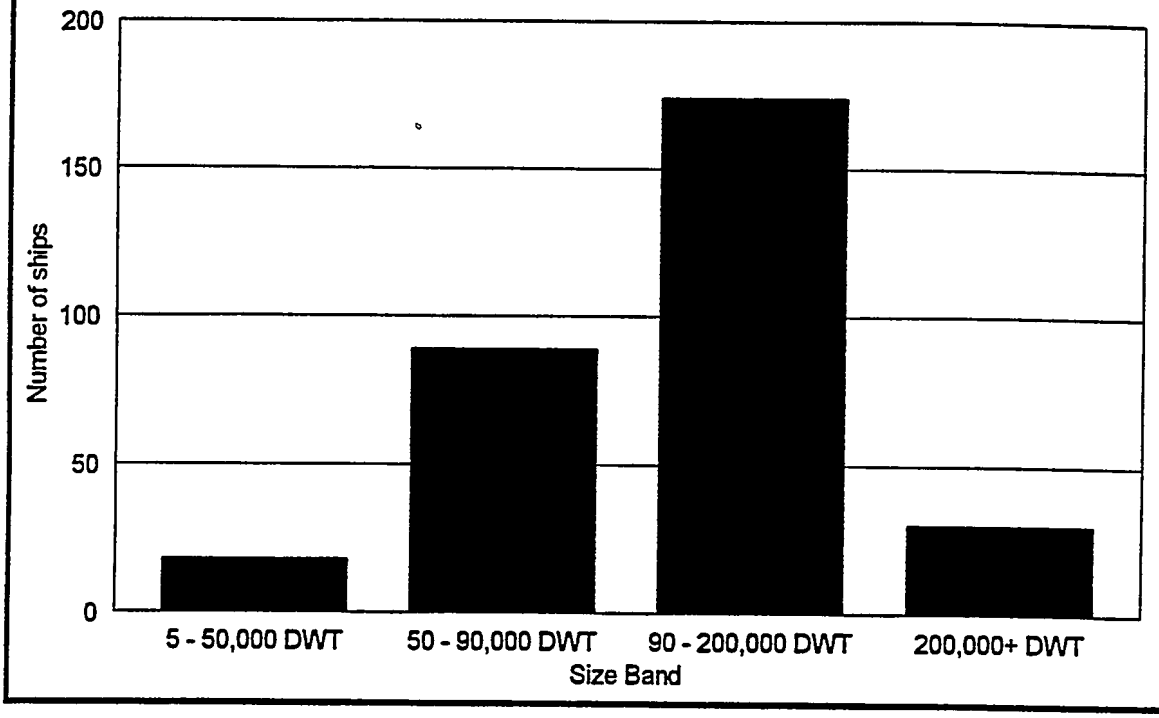


Figure 5.7b : CURRENT FLEET - OBO

DISTRIBUTION BY GROSS TONNAGE

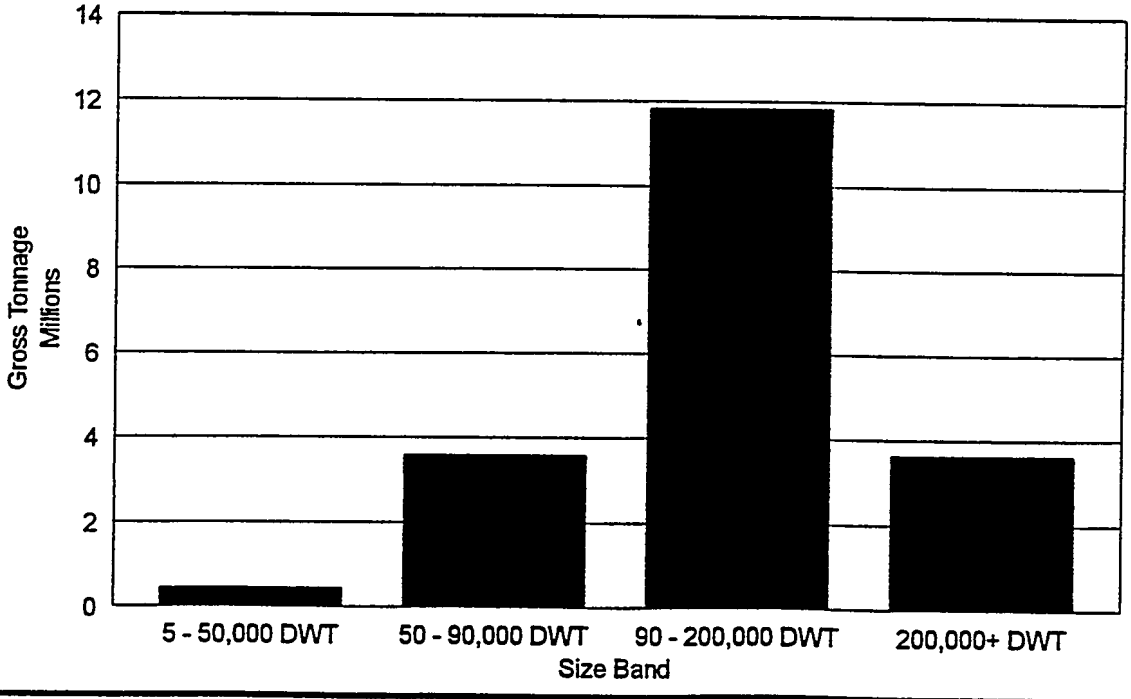


Figure 5.7c : FLEET DEVELOPMENT - OBO

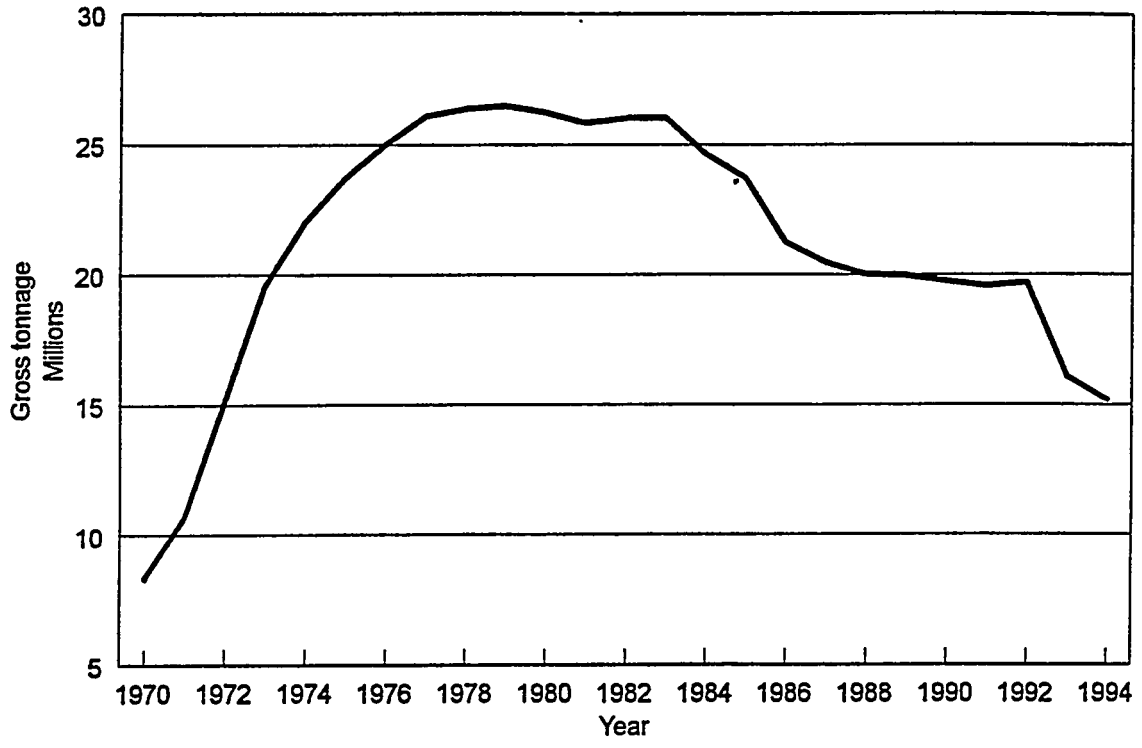
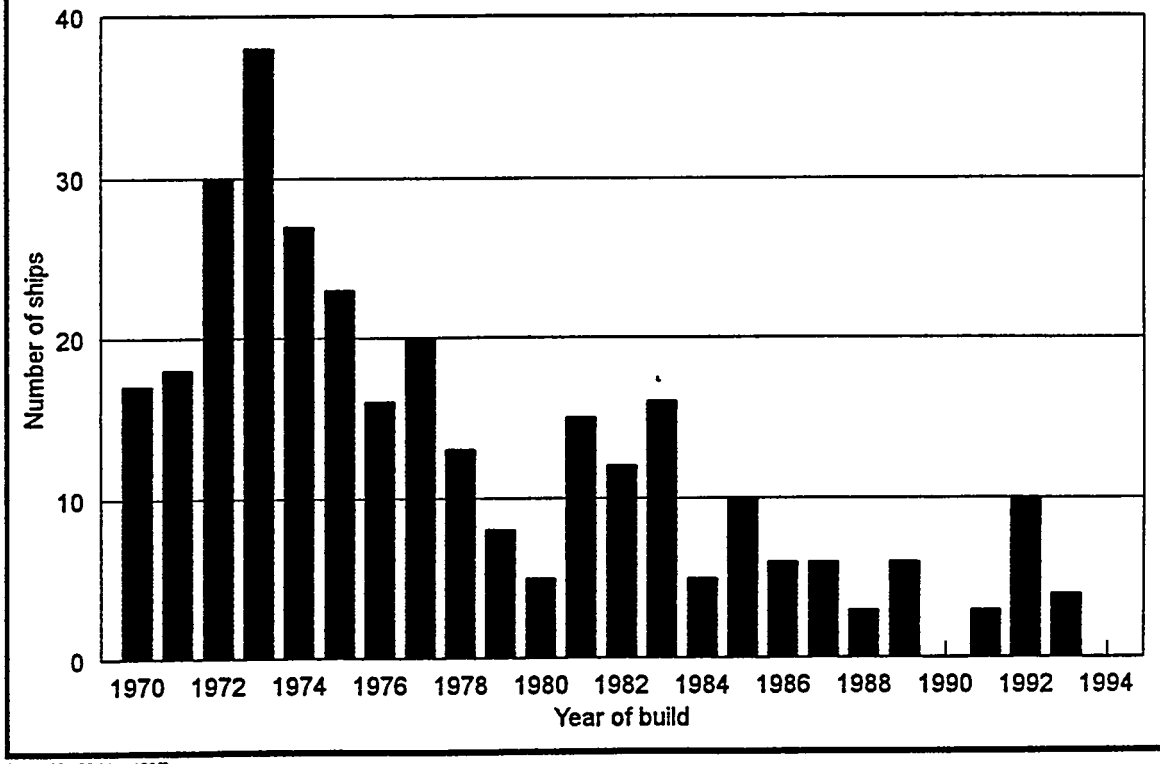


Figure 5.7d : DISTRIBUTION BY AGE - OBO



[spfa405a 22-May-1995]

Figure 5.7e : OWNER NATIONALITY - OBO

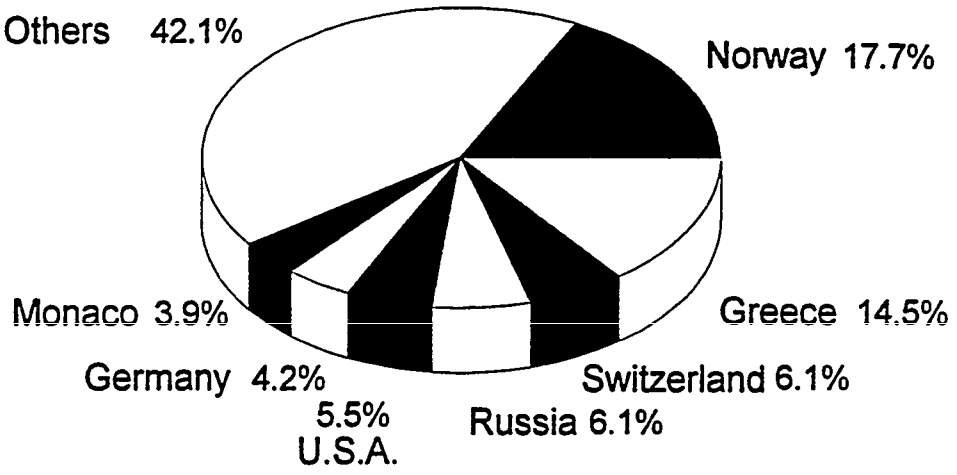
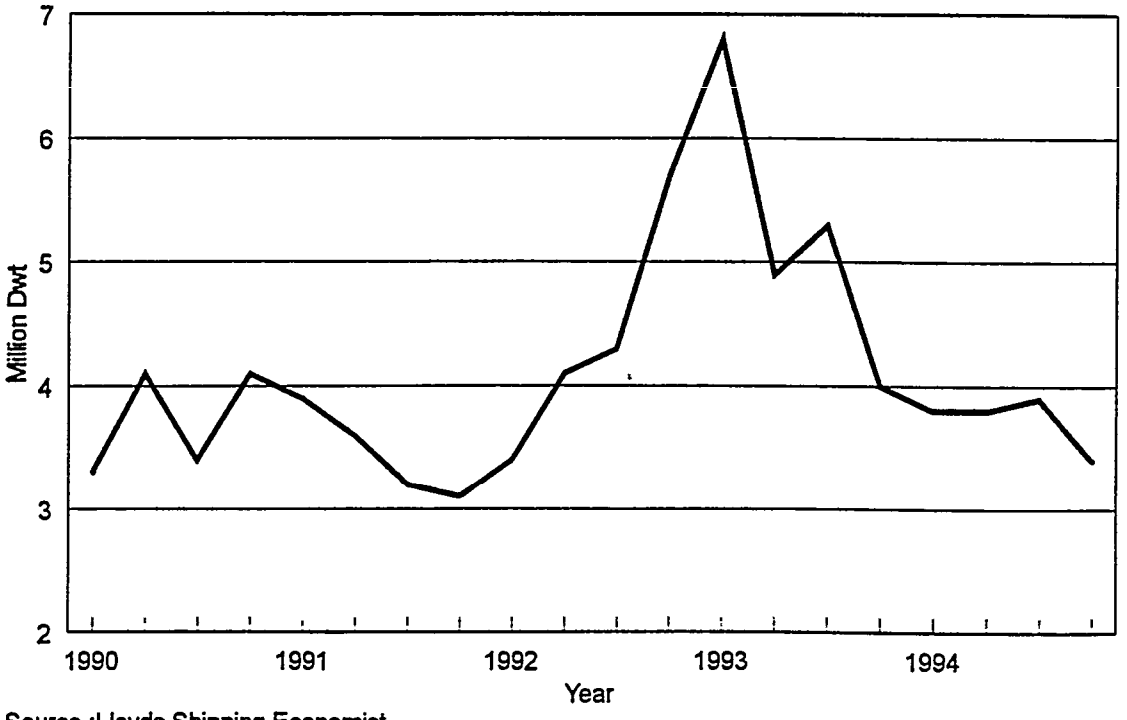


Figure 5.7f : OBO TOTAL SURPLUS



Source :Lloyds Shipping Economist

5.7 GENERAL CARGO SHIPS

- Figures 5.8a - 5.8f illustrate details of the current general cargo ship fleet.

- The general cargo fleet is the second largest sector of the fleet in terms of numbers of ships, at 4,924 vessels.

- The fleet is predominantly under 20,000 dwt, with the distribution as follows:

Dwt	Number of Vessels
5,000-10,000	2,313
10,000-20,000	2,196
20,000+	416

- The average age of the fleet is very high, at 18 years, with the distribution between the size ranges being as follows:

Dwt	Average Age
5,000-10,000	16
10,000-20,000	20
20,000+	14

All sectors are well aged, but the traditional tween-deck sector (10,000 to 20,000 dwt), is particularly old.

- The fleet was largely established in the 1960s and 1970s, with a peak of building in 1977 when 369 ships were delivered. Much of the existing fleet was built as standard designs (such as SD14s or the I HI Freedom series), and this fleet is now significantly old. However, the question that has to be asked is not when the fleet will be replaced but if the fleet will be replaced.

- Relatively few general cargo ships have been built since 1986 and the fleet has been almost continuously declining since 1980. Between 1980 and 1994 the number of ships (including small coastal ships below 5,000 dwt) fell by 25%, and the total tonnage by 31%, an average annual rate of decline of 2.1% per annum and 2.7% respectively.

- Much of the traditional general cargo trades have now been containerized, although modern multi-purpose ships (the successors of the tween-decker fleet) are now being constructed to serve less developed routes and as feeder vessels for the main liner routes. Having said this, the future profile of the fleet is still uncertain.

- In addition to containerization, there has also been a trend towards regionalization, that will further reduce the demand for the larger vessel types. lntra-European/American/Pacific Rim trades generally call for a smaller class of multi-purpose tonnage rather than traditional 10,000 dwt plus. Continuing decline of the traditional fleet therefore seems inevitable. Having said this, the fleet is extremely large and even accounting for decline the level of order books may reach significant levels over the next decade.

- The ownership profile is widely spread, with an increasing concentration in developing countries. This sector is largely open to competition and the orders that will be available should provide good export opportunities. Of the US owned fleet, 153 ships are US registered, whilst the remaining 19 ships are registered outside the USA.

Figure 5.8a : CURRENT FLEET - GENERAL CARGO
DISTRIBUTION BY NUMBER OF SHIPS

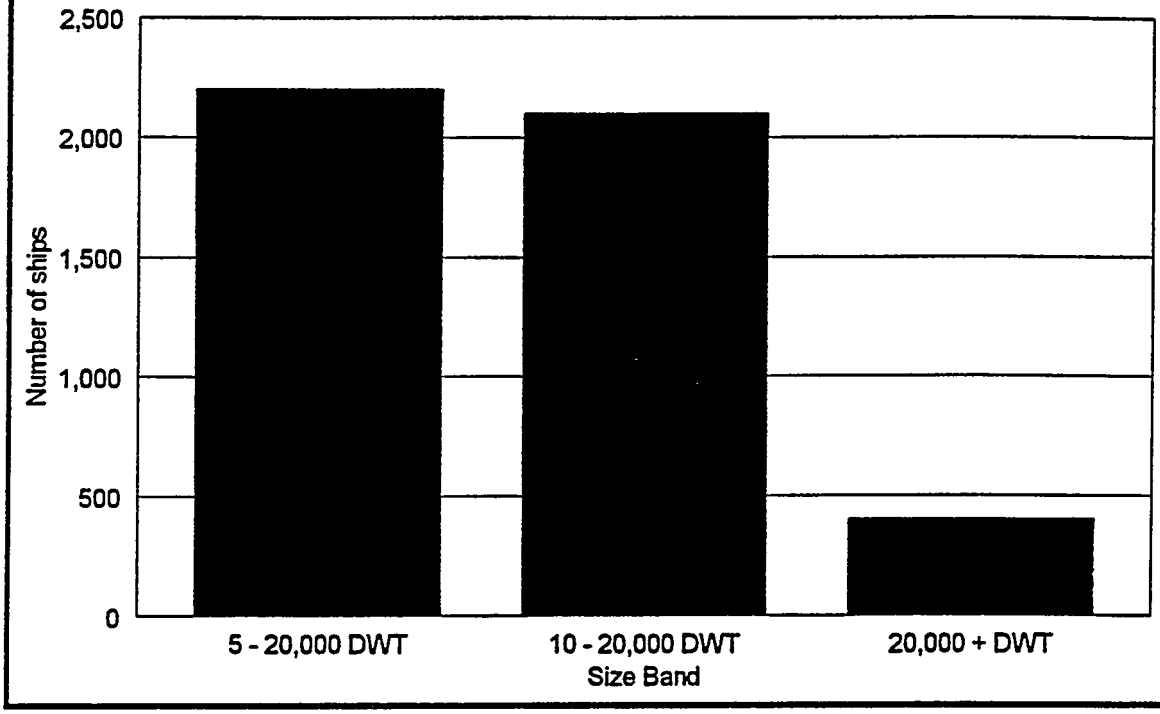
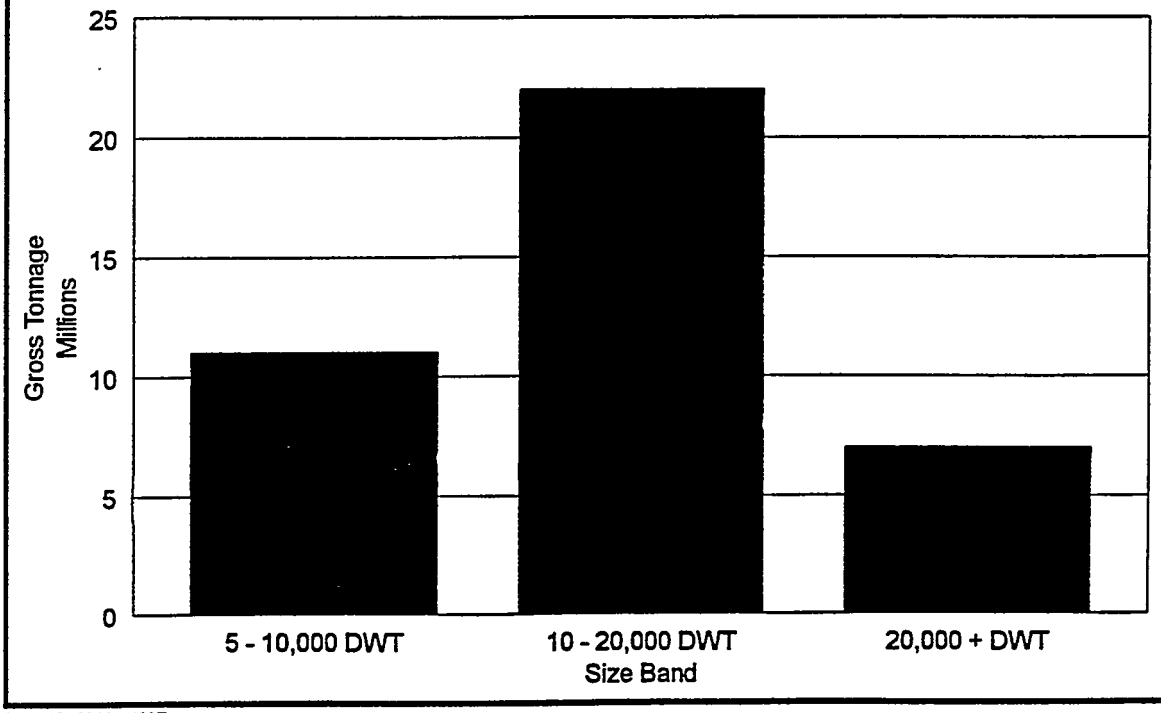


Figure 5.8b : CURRENT FLEET - GENERAL CARGO
DISTRIBUTION BY GROSS TONNAGE



[spfa405a 22-May-1995]

Figure 5.8c : FLEET DEVELOPMENT - GENERAL CARGO SHIP

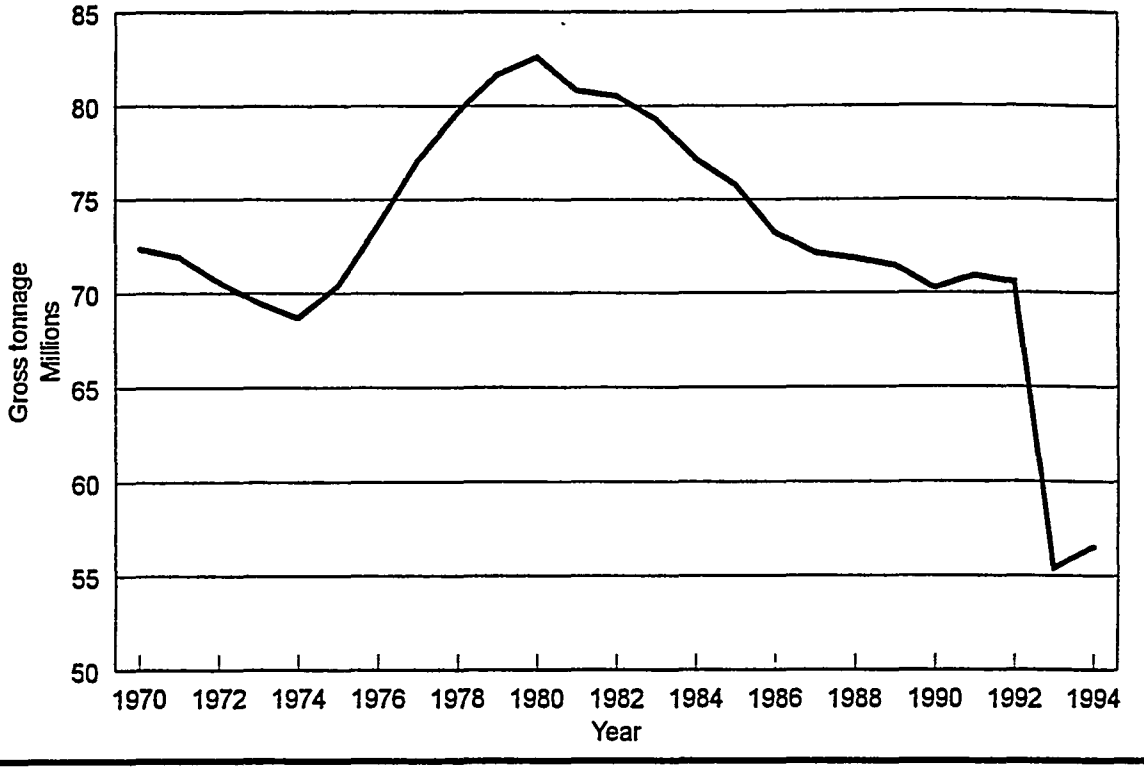


Figure 5.8d : DISTRIBUTION BY AGE - GEN CARGO SHIP

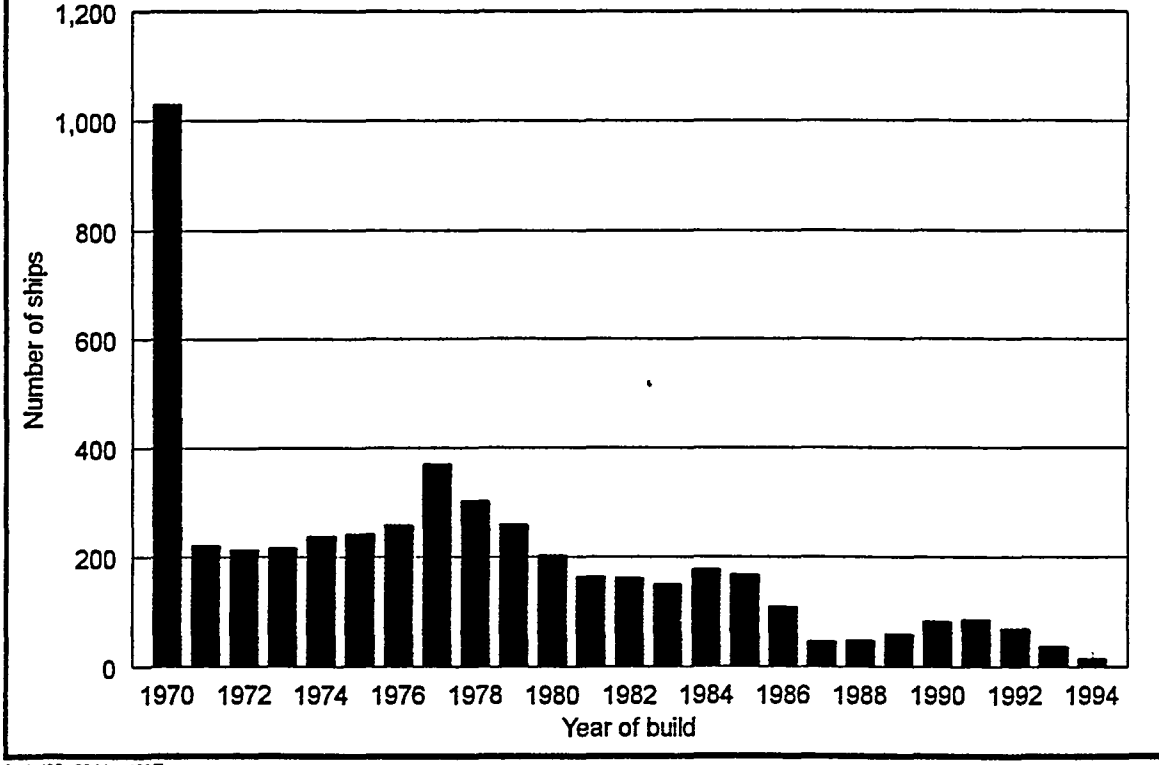


Figure 5.8e : OWNER NATIONALITY - GENERAL CARGO

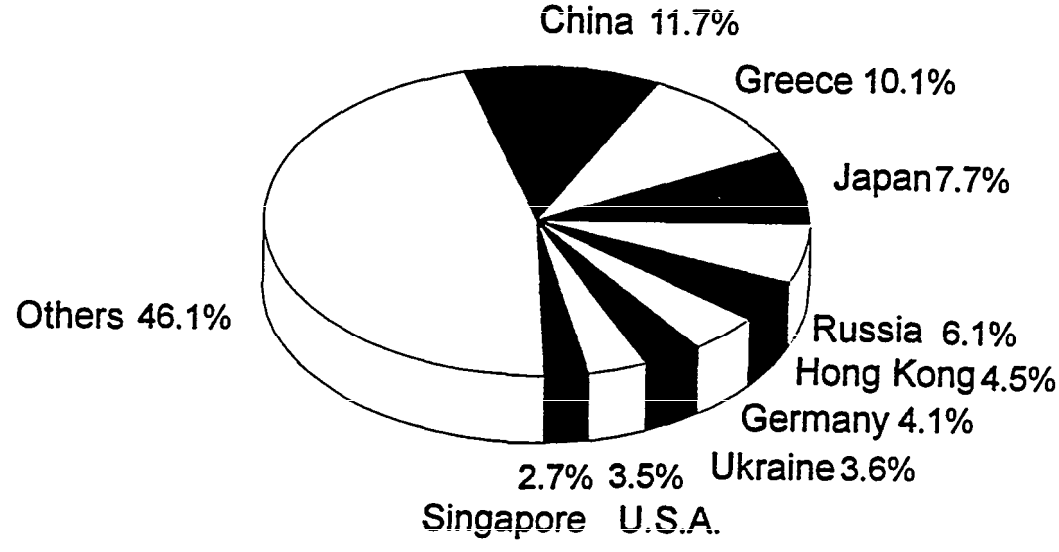
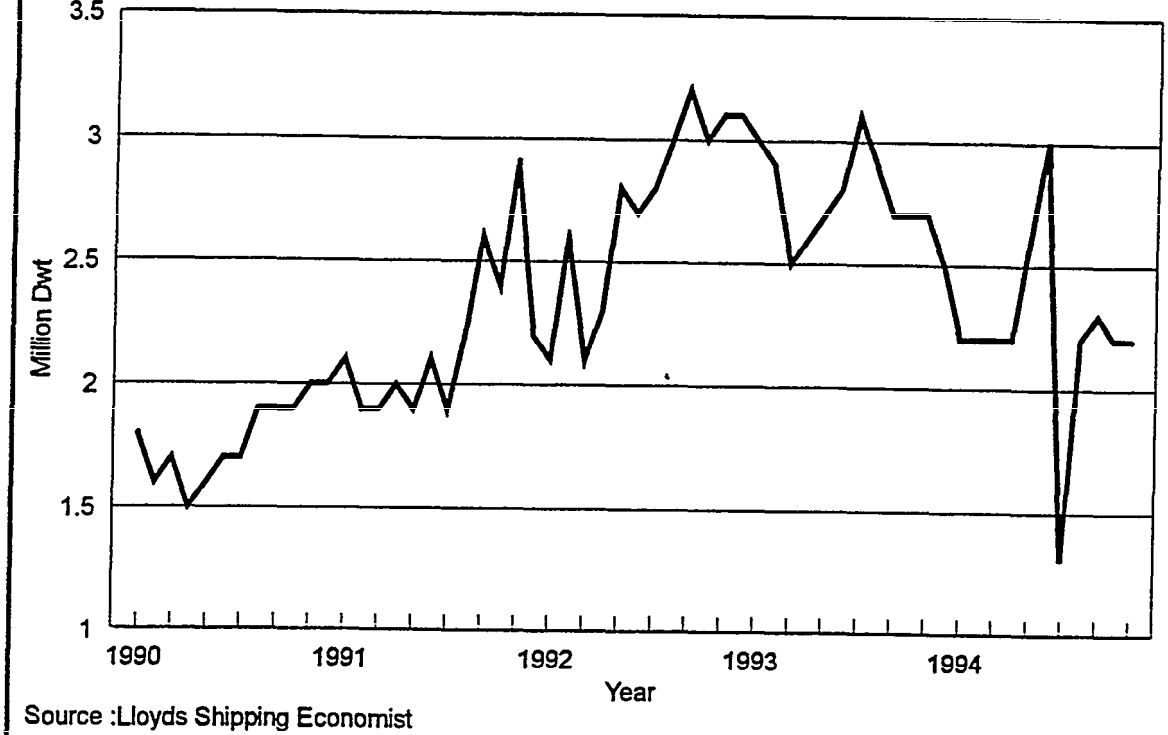


Figure 5.8f : GENERAL CARGO TOTAL SURPLUS



Source :Lloyds Shipping Economist

[spfa405a 22-May-1995]

5.8 **CONTAINER** SHIPS

Ž Figures 5.9a to 5.9f illustrate details of the current container ship fleet.

- The container ship fleet has grown strongly over the past decade, as containerization increases its hold on general cargo trades. The current fleet numbers 1,363 ships.

- The fleet is spread fairly evenly across all size sectors, as follows:

Dwt	**Number of Vessels**
5,000-10,000	230
10,000-20,000	316
20,000-30,000	319
30,000-40,000	197
40,000-50,000	203
50,000+	103

Ž The container fleet is generally modern, with an average age of 11 years. The larger sectors, which have developed recently, show a particularly young age profile, as follows:

Dwt	**Average Age**
5,000-10,000	12
10,000-20,000	11
20,000-30,000	13
30,000-40,000	12
40,000-50,000	8
50,000+	5

- The fleet is still in the development stage, showing strong growth, in particular in recent years of very large container vessels. 1993 saw a peak of deliveries of container ships, with 99 delivered in that year.

Ž Average annual growth rates over the last five years have been 6.5% in terms of numbers of ships and 7.2% in terms of tonnage and order books have continued to rise.

Ž The maximum size of container vessels continues to increase to take advantage of economies of scale. This has lead to the emergence of the so-called “post panamax” fleets of ships, too large to use the canal. The larger fleet sizes have therefore seen the highest growth rates. The estimated split of annual average growth rates over the past five years has been as follows:

Dwt	Annual Growth Rate
5,000-10,000	3.8%
10,000-20,000	4.7%
20,000-30,000	4.7%
30,000-40,000	3.1%
40,000-50,000	7.9%
50,000+	10%

The most important question at this time is how long can the fleet continue to grow at this rate, and when will the fleet development profile turn from growth to maturity. There is increasing danger of over-capacity, with competition increasing on liner runs, although a significant surplus has yet to develop.

The charter rate for a 1,000 TEU container ship has fallen from an average of $12,721 per day in 1991 to $10,770 per day in 1995, and rates are remaining persistently at this level. At some point, the rate of increase of the fleet will reduce to lower levels, as the fleet profile matures. At this time, competition amongst builders who have specialized in this sector will increase significantly, as demand reduces.

Ž The ownership of the container fleet is fairly concentrated, with 67.9% owned in 9 countries. There is a significant element of domestic building preference in this sector of the fleet (including in Germany, Japan, China, Denmark and South Korea), and much of the market may therefore be closed or at least difficult to penetrate. Of the USA owned fleet, 90 vessels are registered as US flag with the remaining 18 ships registered outside of the USA.

Figure 5.9a : CURRENT FLEET - CONTAINER
DISTRIBUTION BY NUMBER OF SHIPS

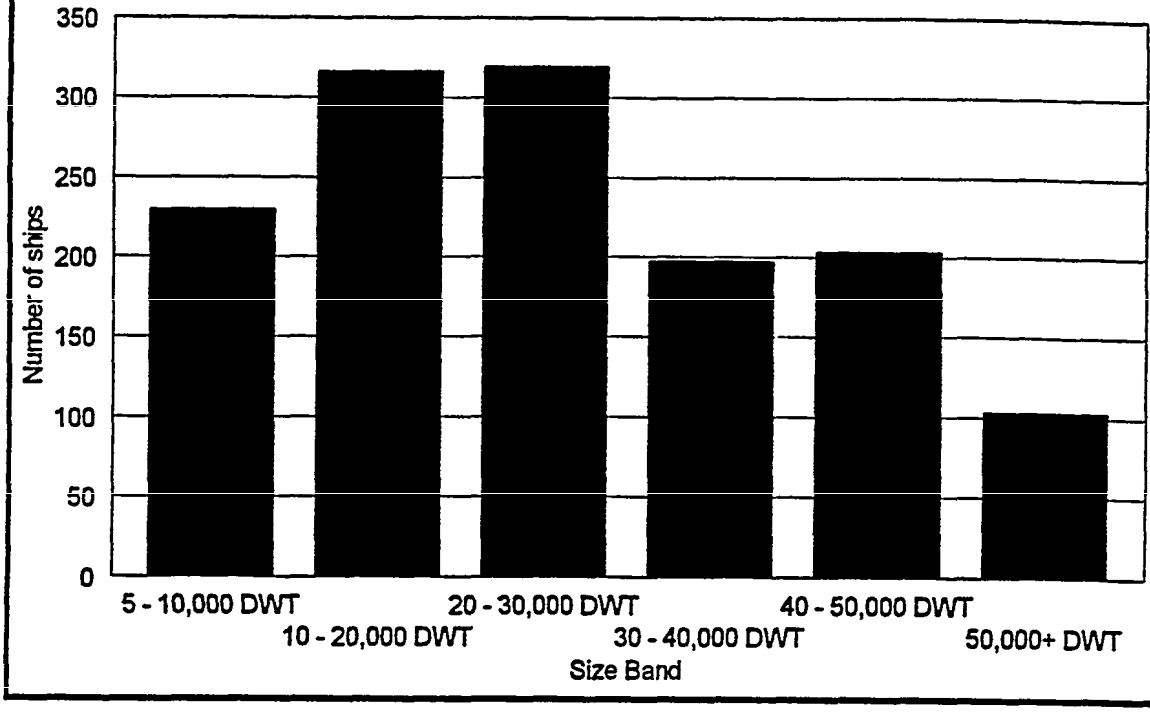


Figure 5.9b : CURRENT FLEET - CONTAINER
DISTRIBUTION BY GROSS TONNAGE

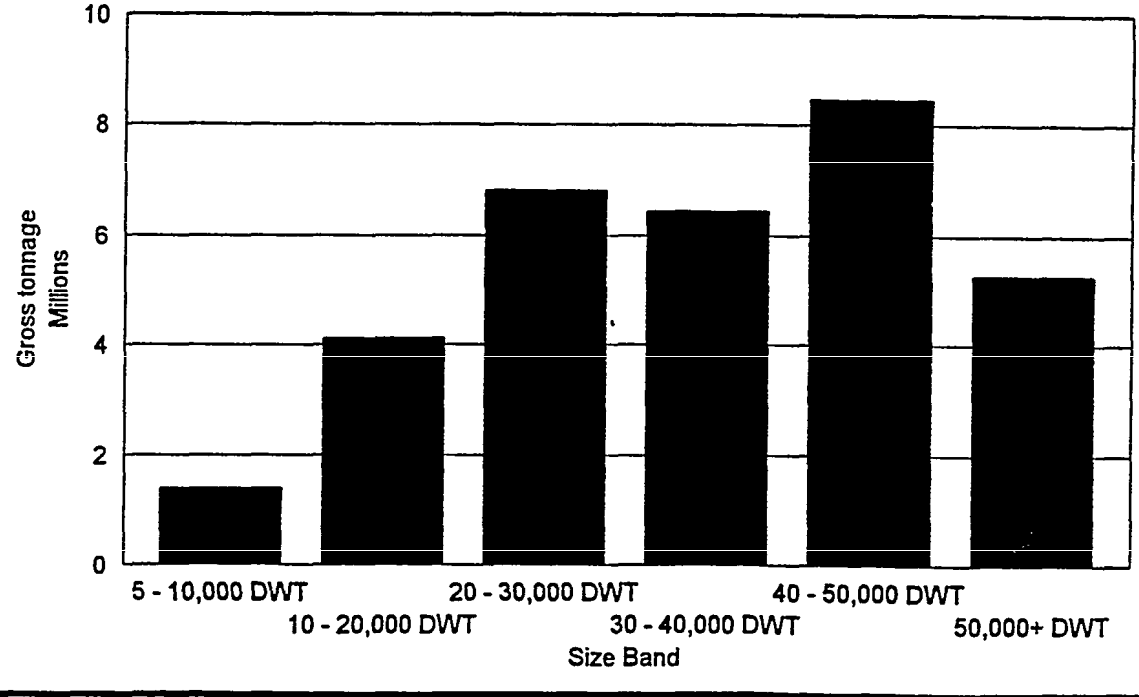


Figure 5.9c : DISTRIBUTION BY AGE - CONTAINER

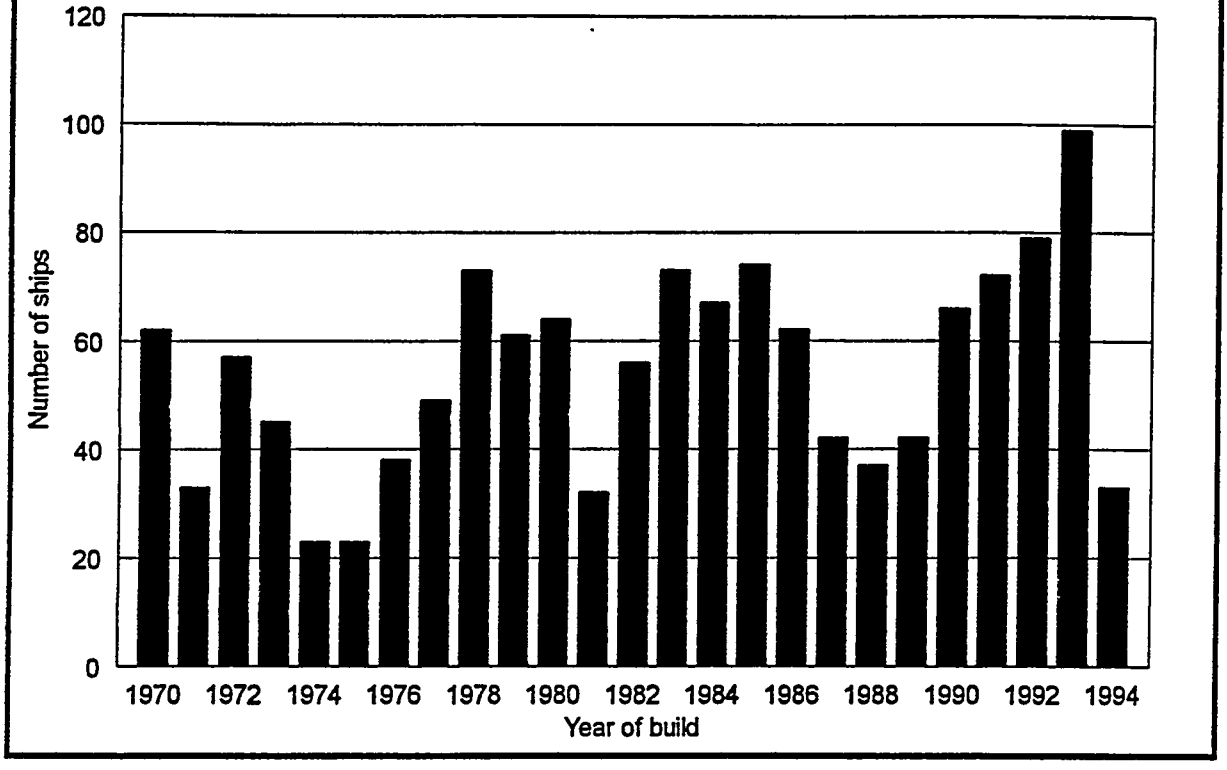


Figure 5.9d : FLEET DEVELOPMENT - CONTAINER SHIP

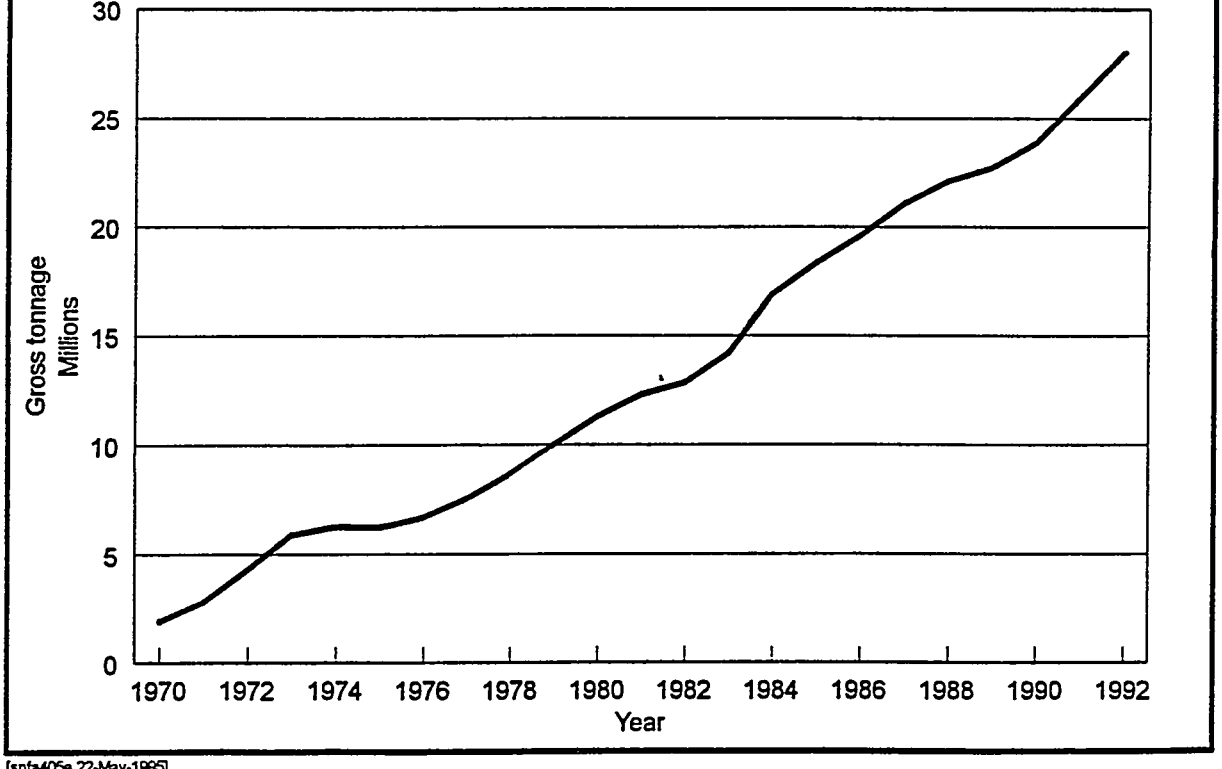


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Figure 5.9e : OWNER NATIONALITY - CONTAINER

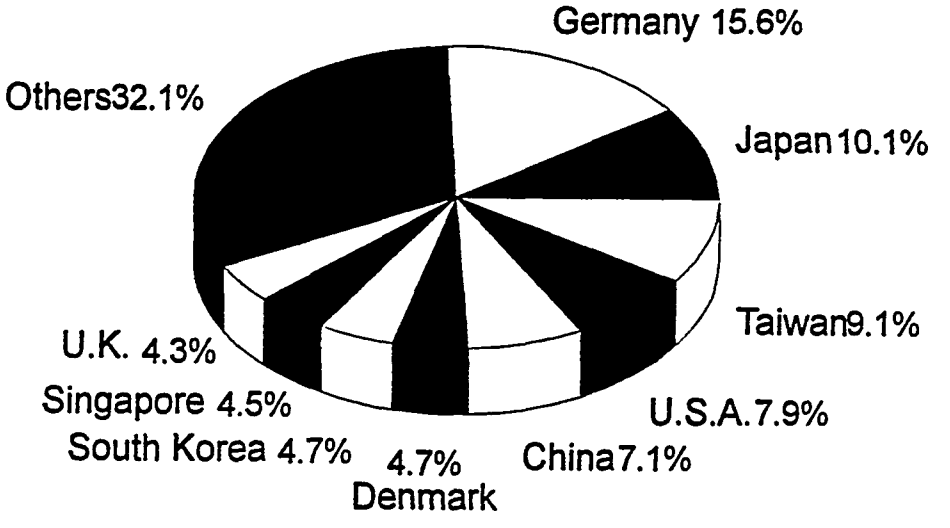
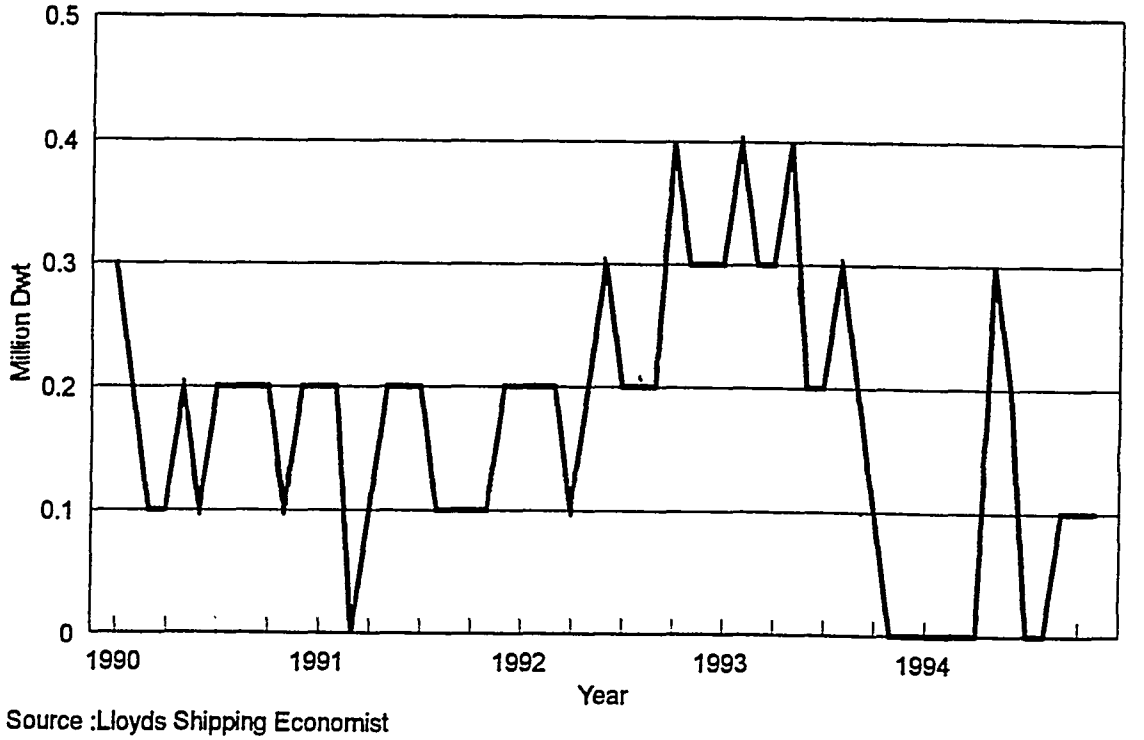


Figure 5.9f : CONTAINERSHIPS TOTAL SURPLUS



Source :Lloyds Shipping Economist

[sp\a405a 22-May-1995]

5.9 REFRIGERATED CARGO

- Figures 5.10a to 5.10d illustrate details of the current reefer ship fleet.

Ž The refrigerated cargo fleet is small, with 785 vessels in total above 5,000 dwt The split of vessels between the size bands is as follows:

Dwt	Number of Vessels
5,000-10,000	547
10,000-20,000	239

- All are below 20,000 dwt, although due to the fact that reefers are volume carriers, this can represent a fairly large ship.

The fleet is fairly modem across the range, with an average age of 13 years. It has developed strongly in recent years, although the rate of growth has now slowed significantly. The number of reefers on order has fallen from 87 at the end of 1992 to 24 at the present time.

Ž The cause of the downturn can be linked to EEC sanctions on imported bananas (ownership of the reefer fleet is concentrated in developed countries, in particular Japan and North West Europe). This decline in market volume has caused at least one builder, Danyard, that previously specialized in reefer construction to leave the market completely.

Ž Over the five years 1989 to 1993, the estimated annual average growth rate o the fleet was as follows:

Dwt	Average Annual Growth Rate
5,000-10,000	4.3%
10,000 to 20,000	5.1%

This rate has now slowed significantly, following the significant downturn in ordering.

Ž In general terms, the ownership of the reefer fleet is concentrated in developed countries, with main elements as follows:

Ž Japan	:	20.4%
Ž North West Europe	:	34%
Ž USA	:	4.6%

These three blocks account for just under 60%. A further 16.1 % is accounted for by former Soviet nations. The utilization of this fleet has declined significantly with the decline of trade with Cuba, following the break-up of the Soviet Union. Of the USA owned fleet, comprising of 36 ships, none are registered as US flag.

Figure 5.10a : CURRENT FLEET - REEFERS
DISTRIBUTION BY NUMBER OF SHIPS

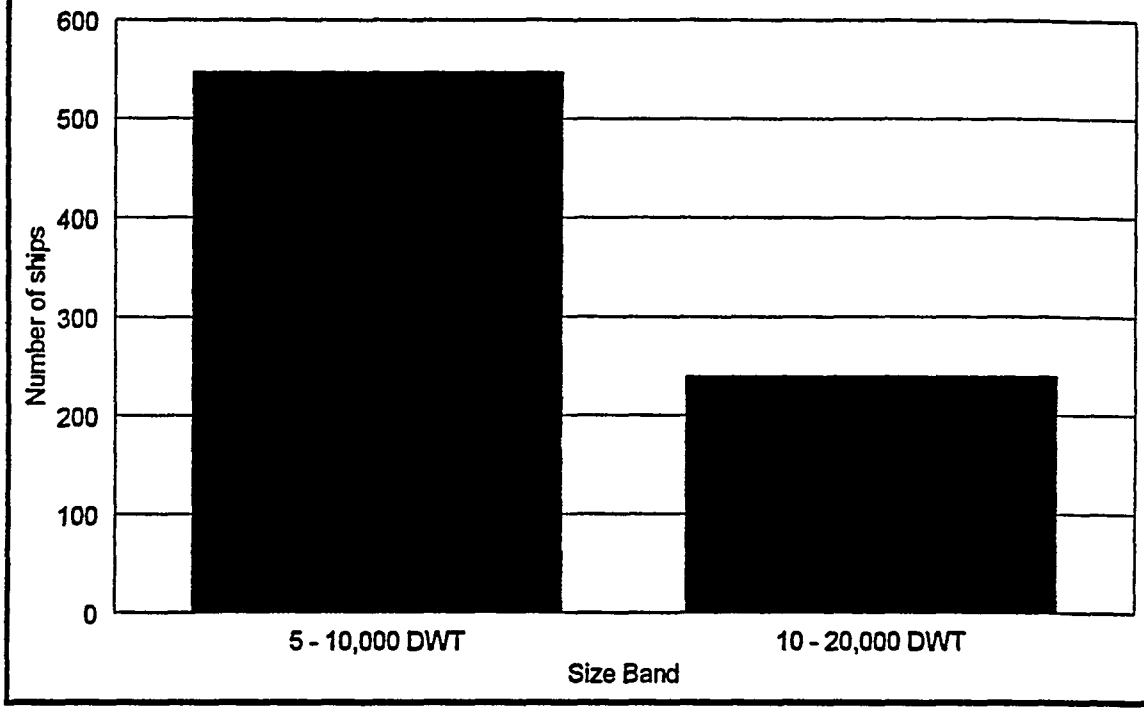


Figure 5.10b : CURRENT FLEET - REEFERS
DISTRIBUTION BY GROSS TONNAGE

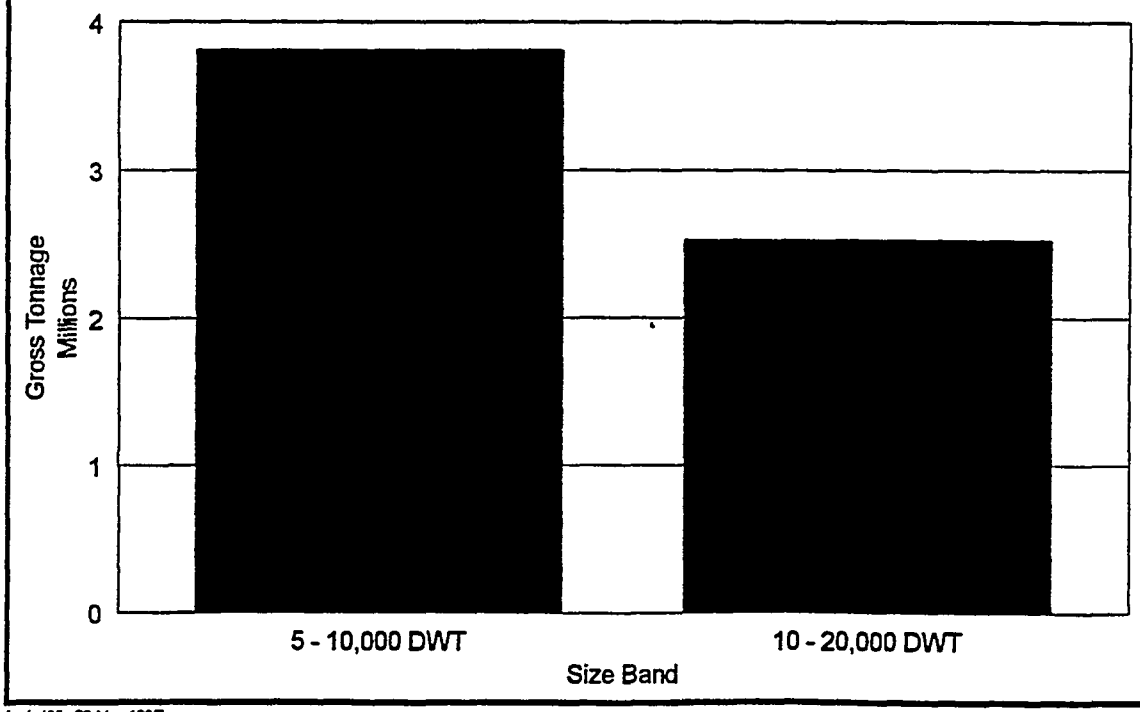


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Figure 5.10c : DISTRIBUTION BY AGE - REEFER

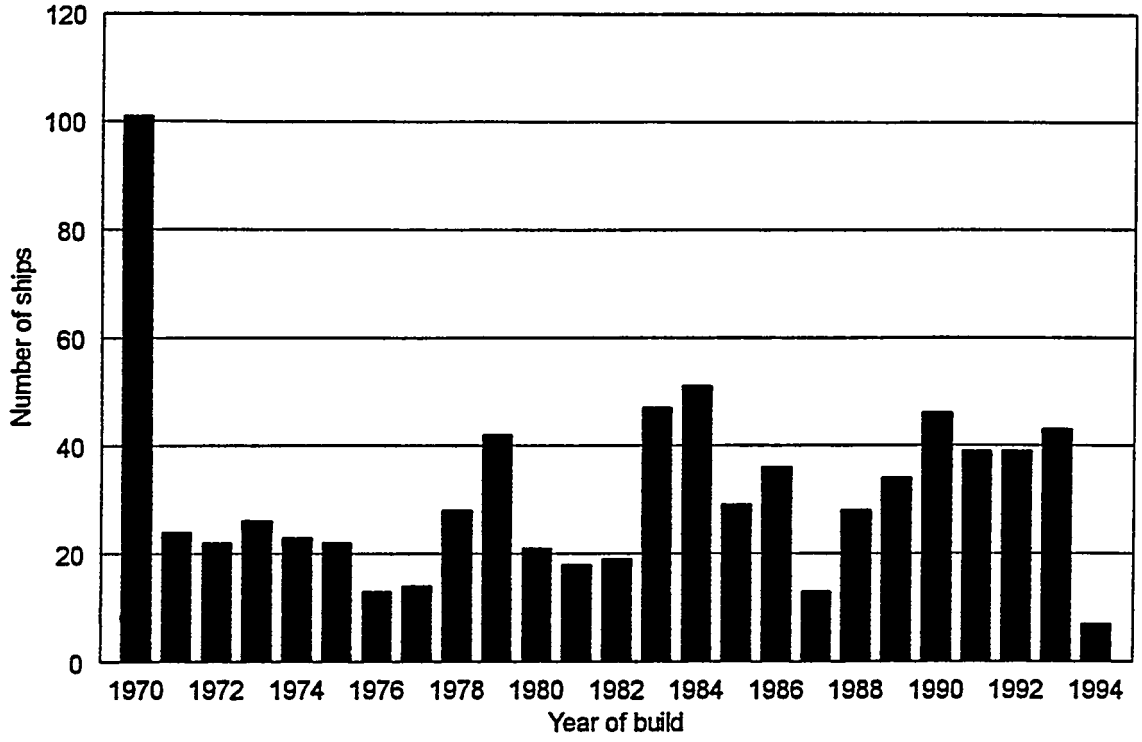
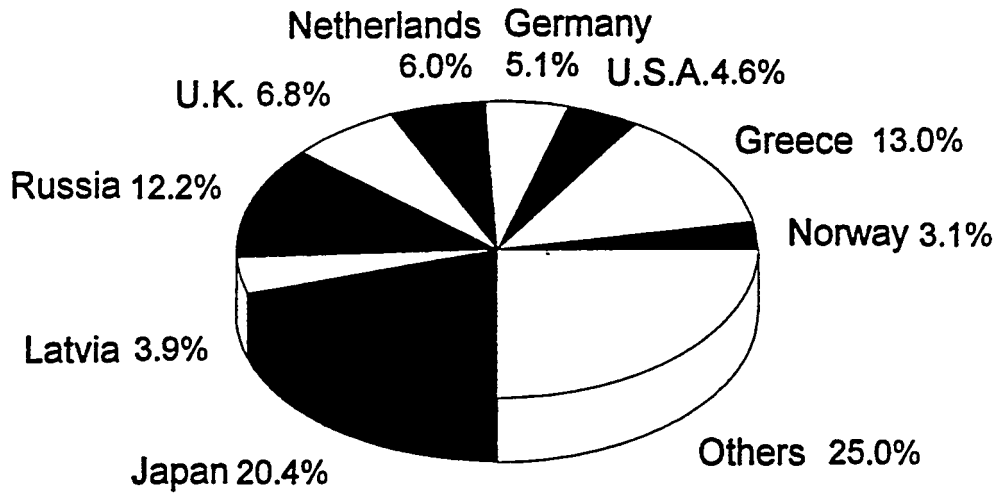


Figure 5.10d : OWNER NATIONALITY - REEFER



5.10 LPG CARRIERS

Ž Figures 5.11 a to 5.1 If illustrate details of the current LPG fleet.

Ž The LPG fleet is small, with a total of 277 ships above 5,000 dwt. These are fairly well distributed across the size ranges, as follows:

Dwt	Number of Vessels
5,000-10,000	86
10,000-20,000	52
20,000-40,000	39
40,000-50,000	50
50,000-60,000	43
60,000+	7

- The fleet is predominantly young, with an average age of 12 years. There have been two main development phases between 1977 and 1984, and with a second growth phase that started in 1990, in response to growing gas trades. Order books have now turned down considerably however, with 31 LPG ships on order only at this time.

- The smaller sectors of the fleet are slightly older than the larger sectors, as follows:

Dwt	Average Age
5,000-10,000	12
10,000-20,000	15
20,000-40,000	13
40,000-50,000	11
50,000-60,000	10
60,000+	11

- It appears that the fleet has been through a second stage of development in response to market growth. The LPG trades are strongly linked to OPEC production, which saw a period of strong growth between 1987 and 1990, but has steadied in recent years. The surge of newbuilding may also have been linked to the Gulf War, that also stimulated tanker trades.

Ž Surplus tonnage fell to 100,000 dwt between 1987 and 1989, but has risen to a current level of 200,000 to 300,000 dwt. Even at this level, the surplus is only around 3% of the fleet supply and growth in trade will lead fairly readily to growth in the fleet.

- Estimated average growth rates between 1989 and 1993 were as follows:

Dwt	Estimated Annual Growth Rate
5,000-10,000	3.87
10,000-20,000	3.92
20,000-40,000	5.09
40,000-50,000	5.39
50,000-60,000	6.53
60,000+	2.71

Ž p Despite moderately strong growth rates recently, the gas carrier fleet is largely in the mature phase. Further strong growth will only be triggered by strong trade growth, and at this time no major developments are expected.

Ž Ownership of the LPG fleet is dominated by two countries: Japan and Norway, together accounting for 41.2% of the fleet. These markets are strongly influenced by domestic ordering patterns and will be effectively closed to exporters in these sectors. A further 33.6% is owned in North West Europe and Hong Kong. Again, domestic ordering patterns will dominate in Germany, Italy and Denmark, leaving only Greece and Hong Kong as significant export targets. Of the USA owned fleet, only one ship is registered as US flag whilst the remaining 7 ships are registered elsewhere.

Figure 5.11a : CURRENT FLEET - LPG GAS CARRIER
DISTRIBUTION BY NUMBER OF SHIPS

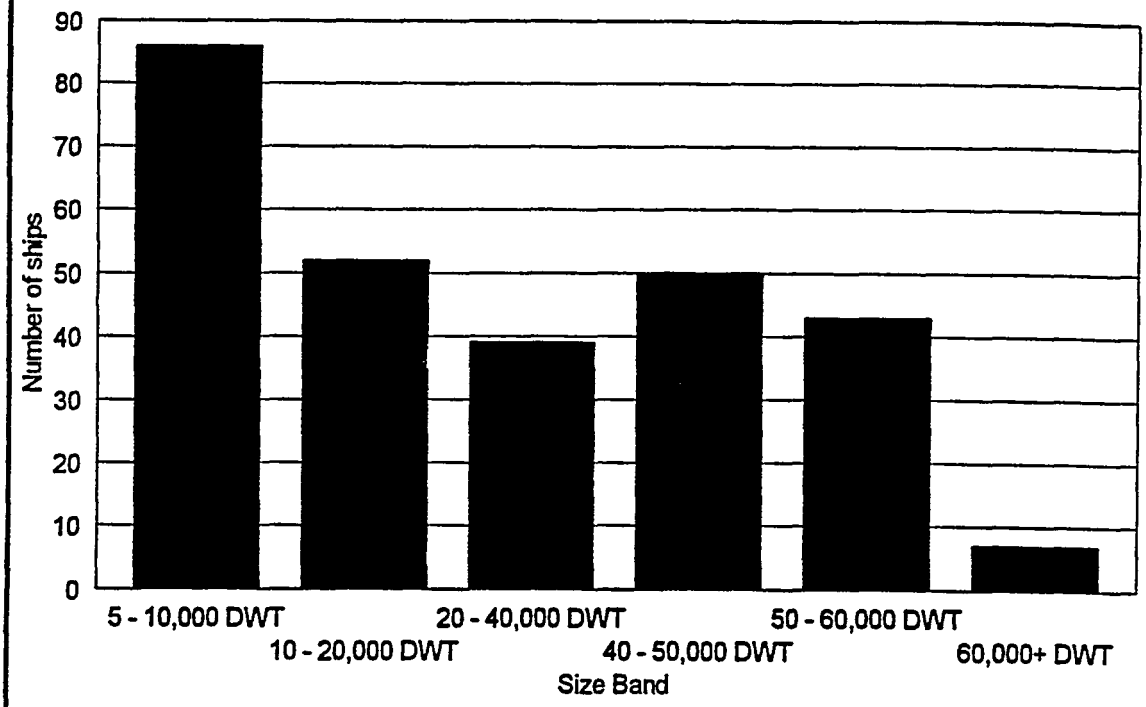


Figure 5.11b: CURRENT FLEET - LPG GAS CARRIER
DISTRIBUTION BY GROSS TONNAGE

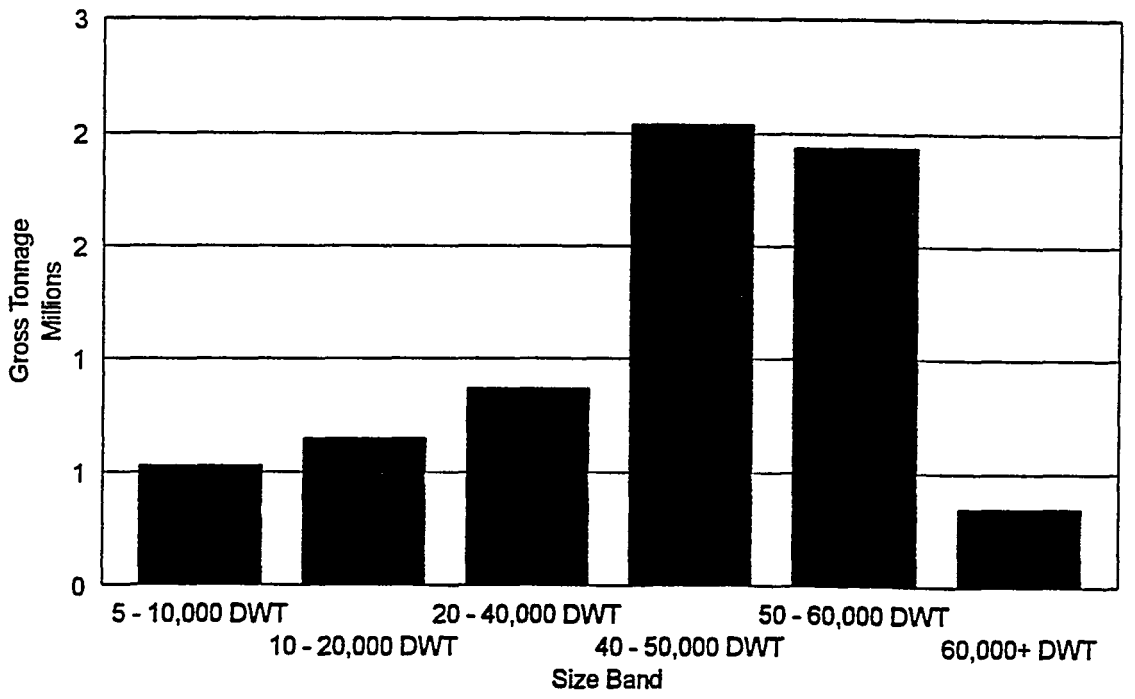


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Figure 5.11c : DISTRIBUTION BY AGE - LPG GAS CARRIER

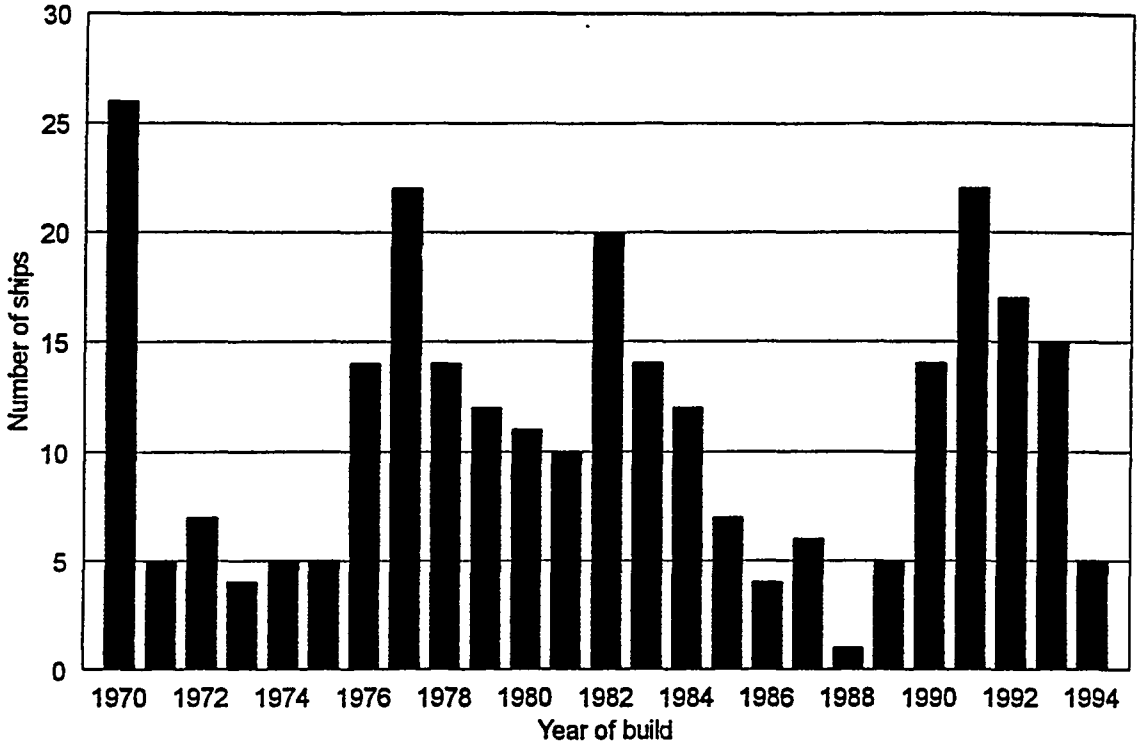
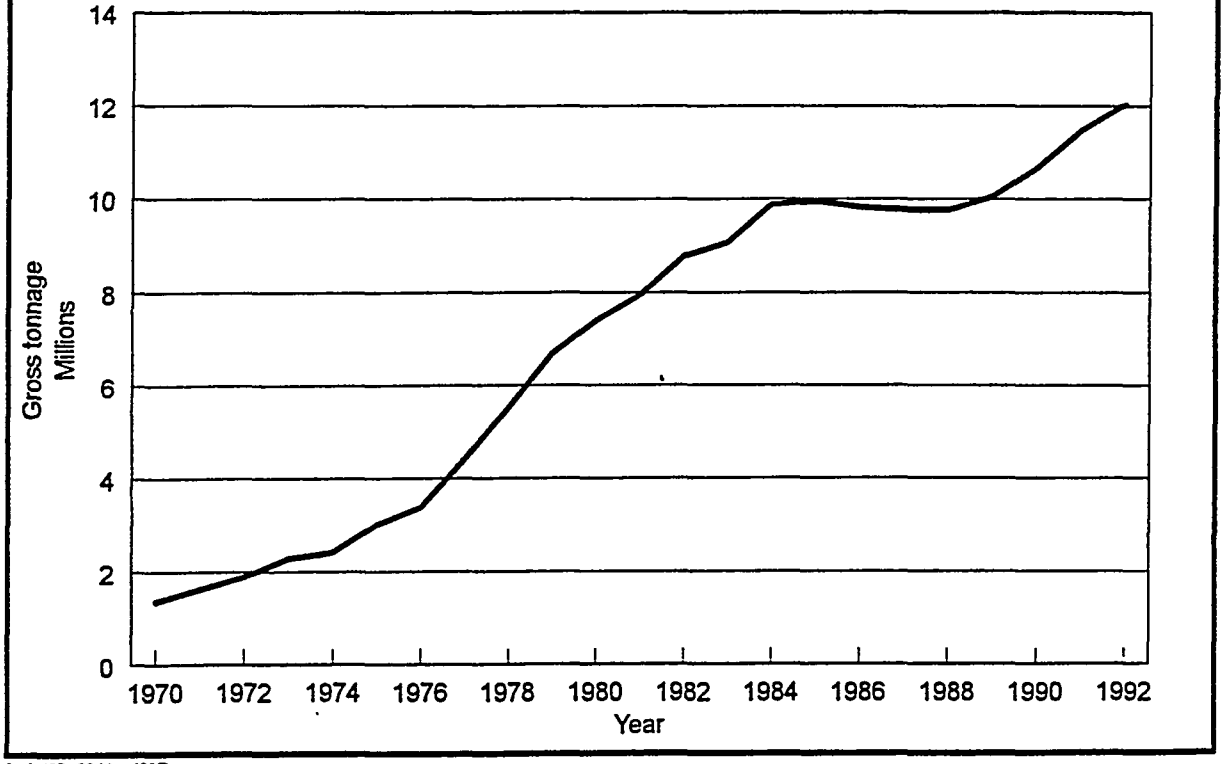


Figure 5.11d : FLEET DEVELOPMENT - GAS CARRIER



[spfa405a 22-May-1995]

Figure 5.11e : OWNER NATIONALITY - LPG GAS CARRIER

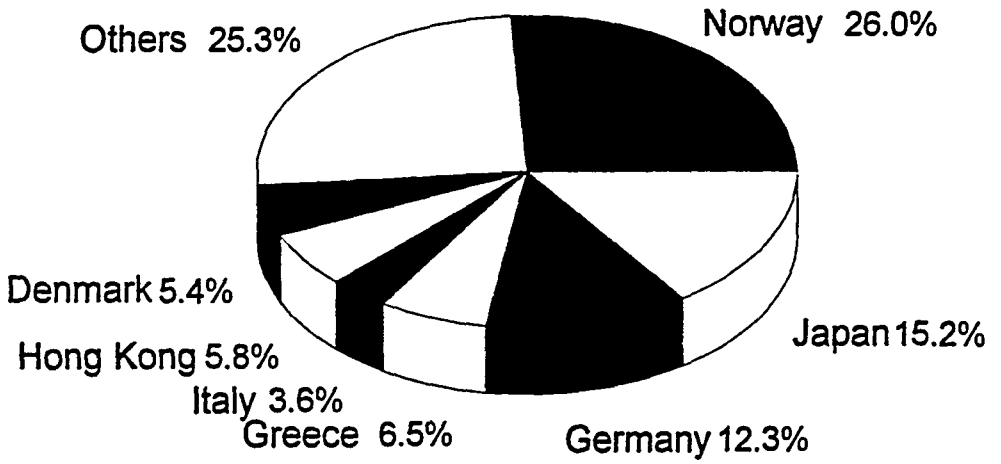
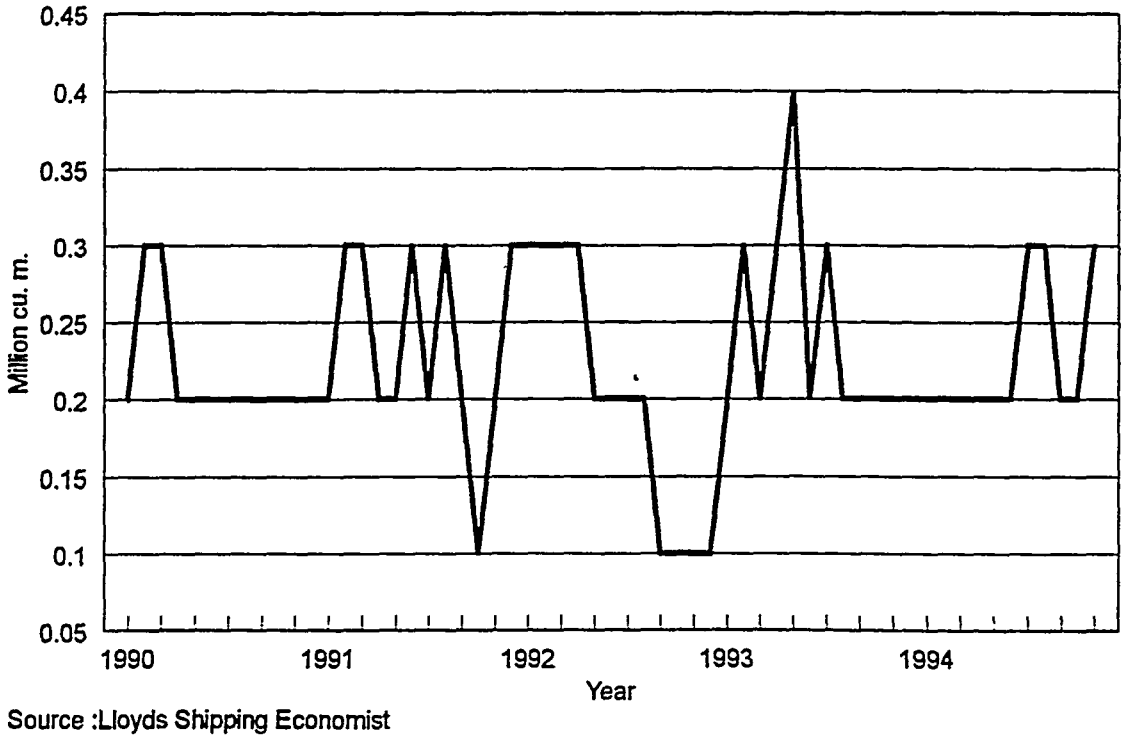


Figure 5.11f : LPG CARRIERS TOTAL SURPLUS



Source :Lloyds Shipping Economist

5.11 LNG CARRIERS

- Figures 5.12a to 5.12e illustrate details of the current LNG carrier fleet.

Ž This is the smallest sector of the fleet and is highly specialized. The total flee size is 78 ships. The fleet includes a number of very large vessels, with two thirds of the fleet being over 60,000 dwt:

Dwt	Number of Vessels
10,000-30,000	12
30,000-60,000	14
60,000-70,000	31
70,000+	21

Ž The average age of the fleet is remarkably high, at 15 years. The peak of building occurred in the 10 years between 1974 and 1984, although even during this period, the peak of production was only 8 ships, delivered in 1977.

- Few vessels were built through the 1980s and early 1990s but the order book has now picked up considerably with 19 ships on order at this time. This increase has coincided with a reduction in fleet surplus from 2.5 million dwt in 1986 to 80,000 dwt by 1991; a reduction from around 34% surplus to around 9%. In recent months the surplus has started to rise again however, to around 1.1 million dwt. This will be in response to new deliveries into the fleet, and it is uncertain that without a corresponding increase in trade, the current rate of building can be sustained without damaging the balance in this sector.

Ž Because the fleet is so small, small increases in ship numbers are reflected in fairly high growth rates. In general the fleet is well established, although the average growth rate over the past five years has been 3.4%.

- Ownership of the LNG fleet is concentrated in six countries, together accounting for 78.2% of the total fleet. These countries are as follows:

UK	:	23.1%
USA	:	17.9%
Japan	:	14.1%
Algeria	:	7 . 7 %
Germany	:	7.7%
Malaysia	:	7.7%

Of the USA owned fleet, 13 of the 14 ships are US registered.

Figure 5.12a : CURRENT FLEET - LNG GAS CARRIER
DISTRIBUTION BY NUMBER OF SHIPS

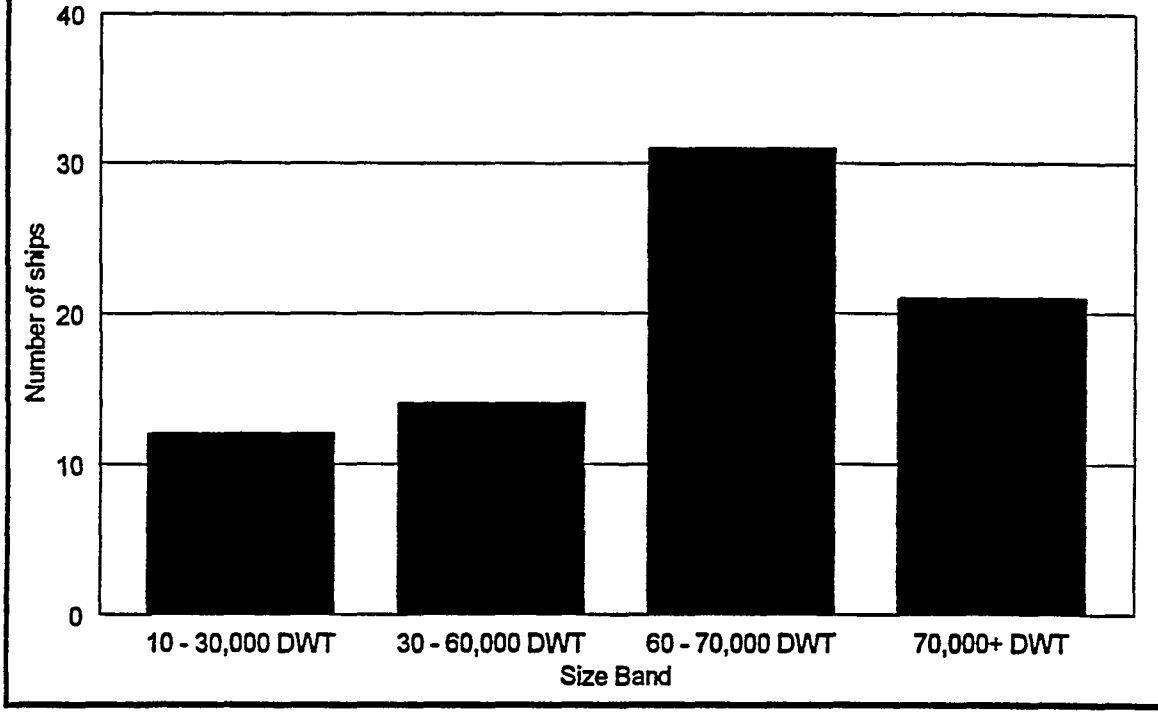


Figure 5.12b : CURRENT FLEET - LNG GAS CARRIER
DISTRIBUTION BY GROSS TONNAGE

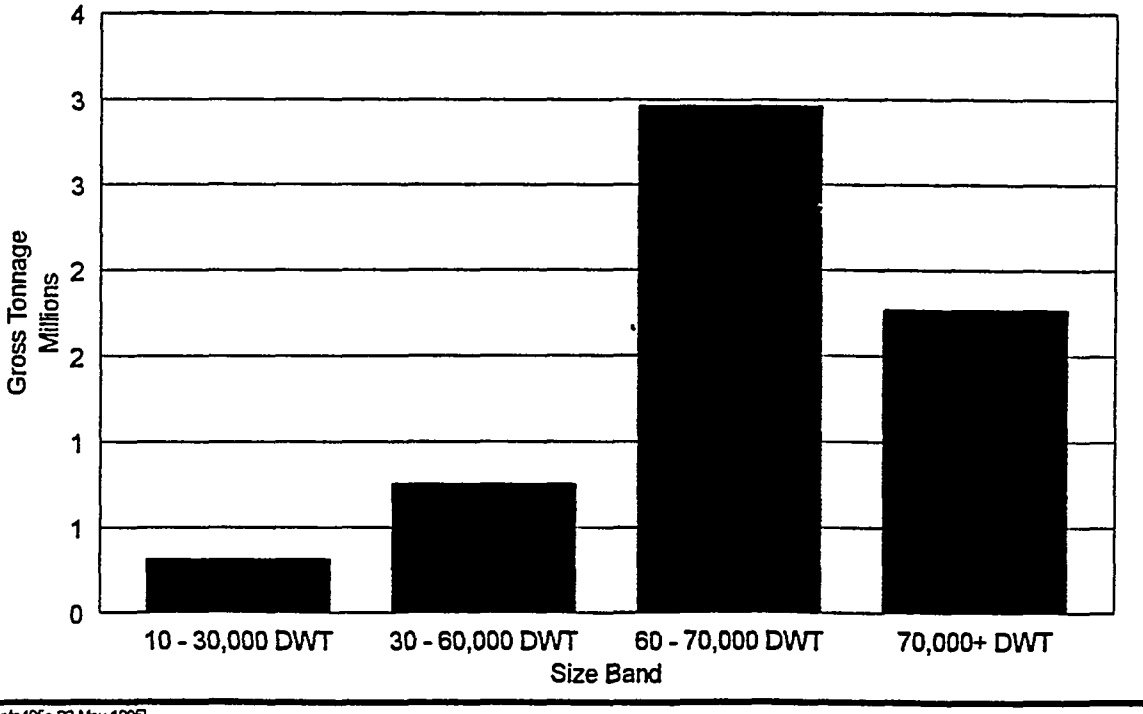


Figure 5.12c : DISTRIBUTION BY AGE - LNG GAS CARRIER

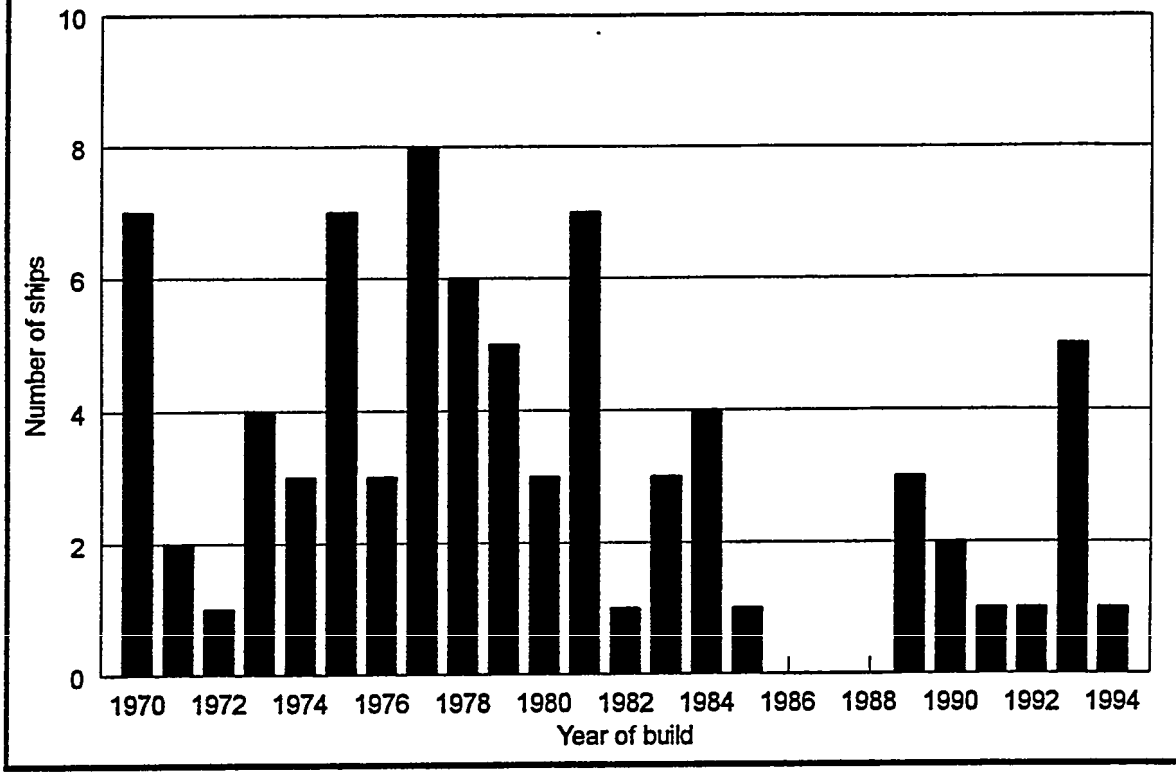


Figure 5.12d : OWNER NATIONALITY - LNG GAS CARRIER

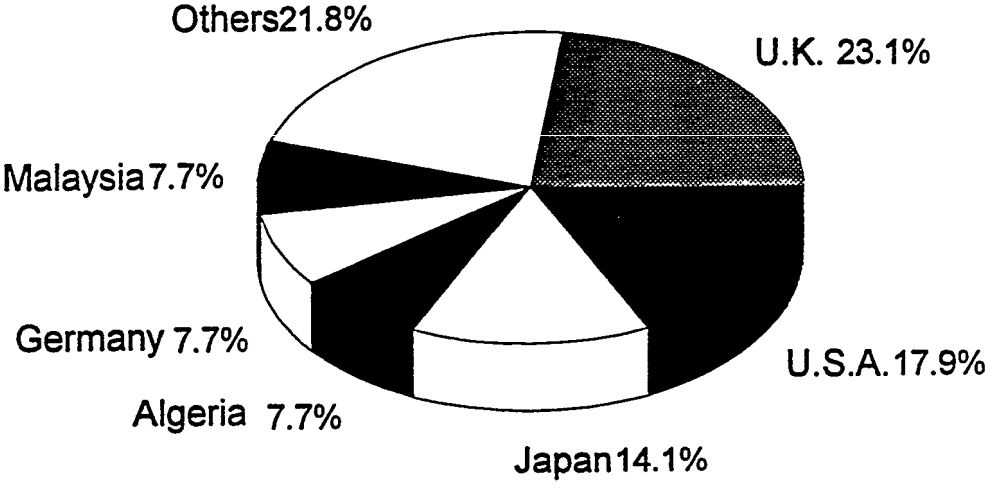
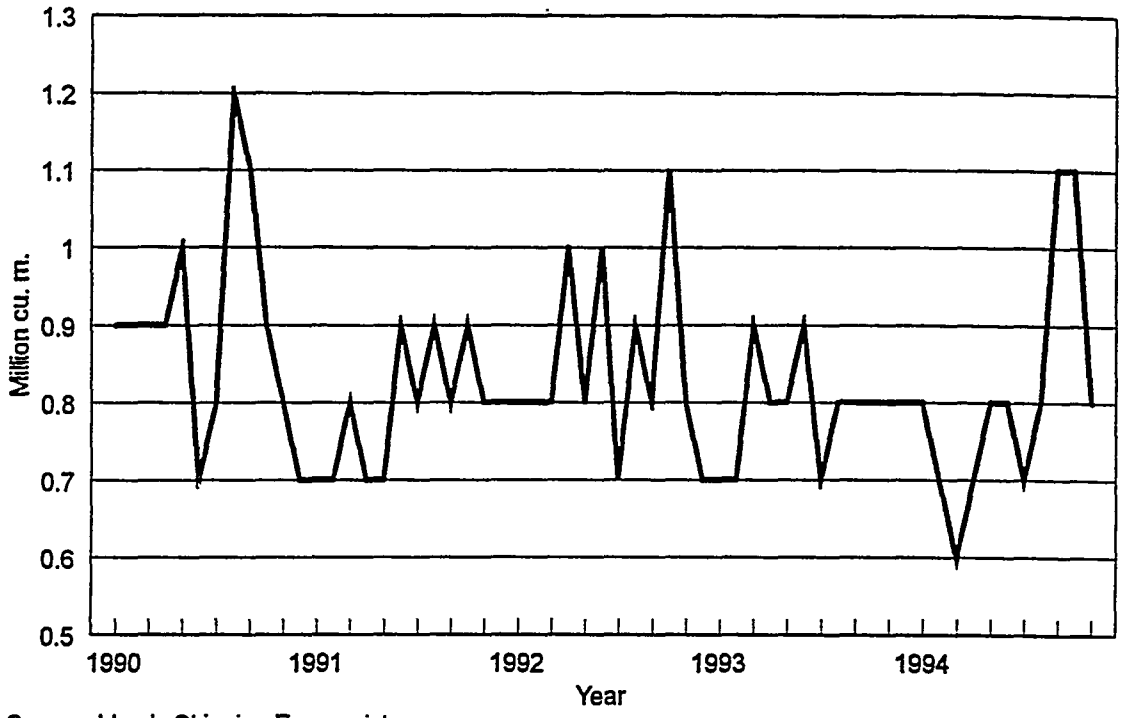


Figure 5.12e : LNG CARRIERS TOTAL SURPLUS



Source :Lloyds Shipping Economist

5.12 FERRIES

- Figures 5.13a to 5.13d illustrate details of the current ferry fleet.

- The ferry market is in general significantly more localized than other sectors of the merchant ship market. Ferries tend to be built for specific routes, examples being Baltic, English Channel, North Sea, Indonesia, Canada, etc.

- The market is largely open, but in some cases where ferries are controlled by Government agencies, for example, in Canada, competition may be controlled.

- The total fleet numbers 793 ships, divided by size as follows:

Gross Tonnage	**Number of Vessels**
< 5,(300	**354**
5,000-10,000	225
10,000-20,000	150
20,000+	66

- The fleet saw a peak of building in the first half of the 1970s, with the level of building generally falling off through much of the 1980s. An increase in the market has been seen so far in the 1990s, and a second growth phase is being seen, in particular with the establishment of the larger so-called “super ferry” category.

- The average age of the ferry fleet is 15 years, although this age is less significant than for cargo carrying sectors of the fleet, with ferries generally designed for a life in excess of 30 years. The largest sectors of the fleet are younger than the smaller sectors, and above 20,000 GT the fleet is still very much in the establishment stage. The average ages are as follows:

Gross Tonnage	**Average Age**
< 5,()()0	15
5,000-10,000	19
10,000-20,000	13
20,000+	8

- This development has also been reflected in growth rates, which have been significantly higher in the super ferty category. The following statistics present the estimated average annual growth rates over the past five years.

Gross Tonnage	Estimated Annual Average Growth Rate
< 5,(300	5%
5,000-10,000	1.96%
10,000-20,000	3.13%
20,000+	7.78%

The latest wave of building is continuing with 74 ferries on order at this time.

The profile of nationality shows a surprising concentration in nine countries accounting for 68.4% of the fleet, with concentrations in the following blocks:

Europe	:	45.9%
Japan	:	19.1%
Canada	:	3.4%

This degree of concentration, in countries that show strong domestic ordering tendencies will restrict the available market in this sector, in a general export sense. Of the USA owned fleet 13 ships are registered as US flag vessels with the remaining 6 ships registered outside the country.

Figure 5.13a : CURRENT FLEET- FERRY

DISTRIBUTION BY NUMBER OF SHIPS

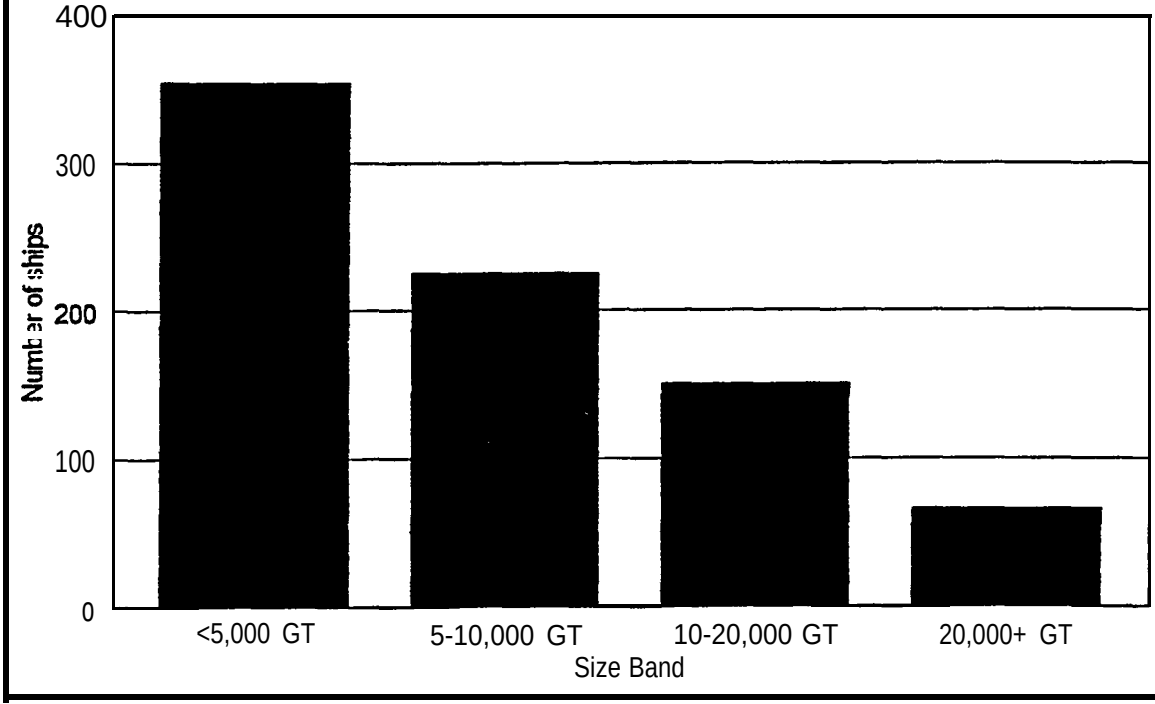


Figure 5.13b: CURRENT FLEET - FERRY

DISTRIBUTION BY GROSS TONNAGE

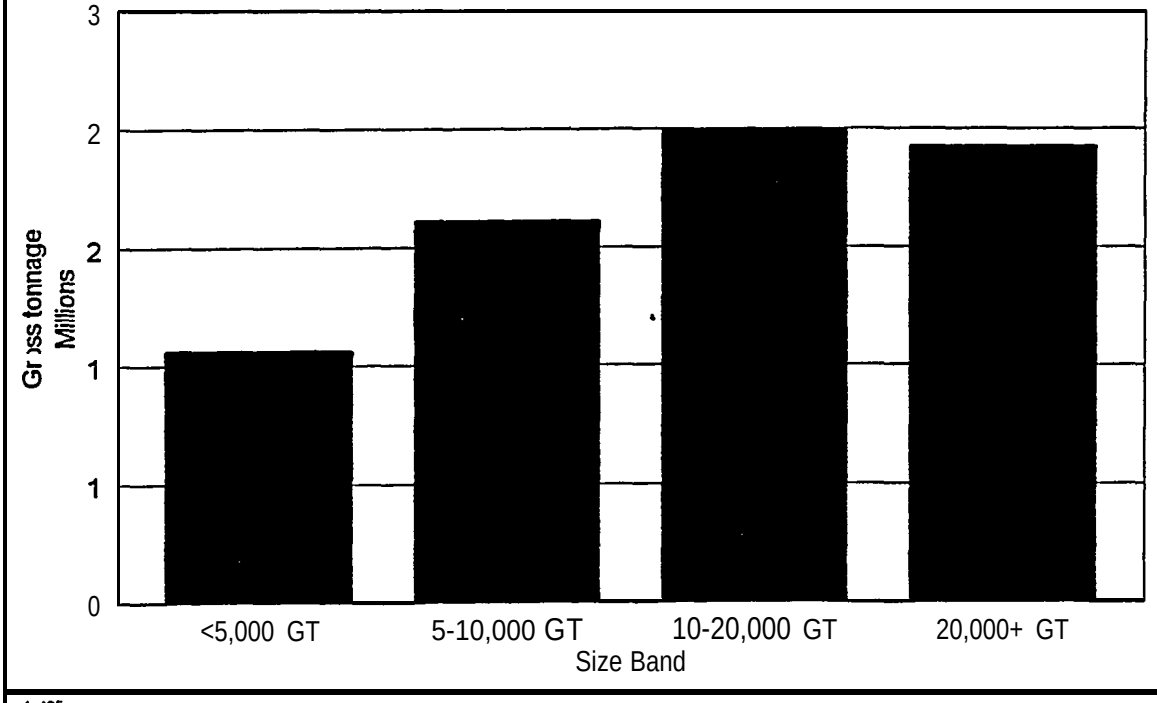


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Figure 5.13c : DISTRIBUTION BY AGE - FERRY

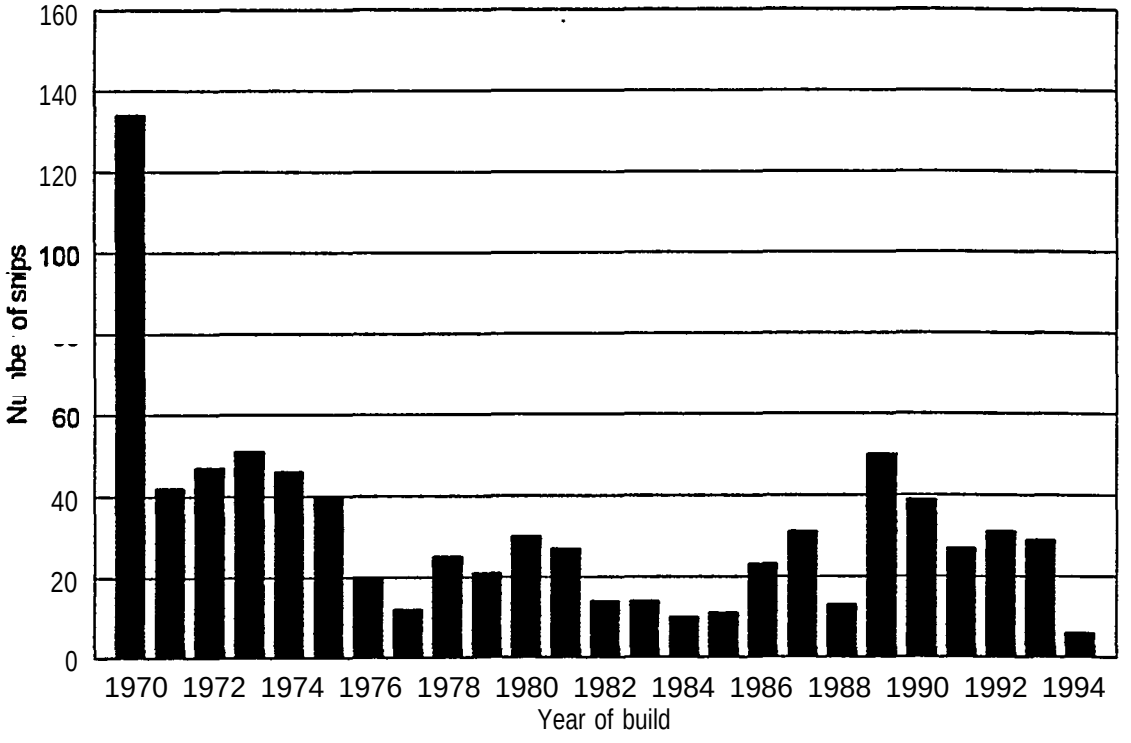
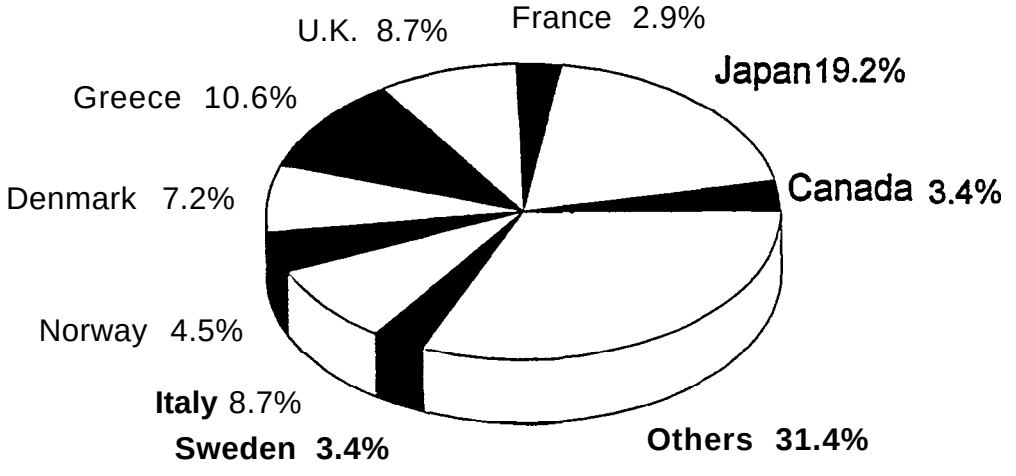


Figure 5.13d : OWNER NATIONALITY - FERRY



5.13 PASSENGER VESSELS

- Figures 5.14a to 5.14d illustrate details of the current passenger fleet.

- The world passenger ship fleet numbers 478 ships, with size distribution as follows:

Gross Tonnage	Number of Vessels
< 5,()()0	216
5,000-10,000	91
10,000-20,000	91
20,000-50,000	65
50,000+	16

- The average age of the fleet is high, at 21 years, but against a life expectancy in excess of 30 years this is much less significant than for cargo carrying sectors of the fleet. The average age of the different fleet sectors is as follows:

Gross Tonnage	Average Age
< 5,000	21
5,000-10,000	21
. 10,000-20,000	**22**
20,000-50,000	1 9
50,000+	**7**

- Building of passenger vessels proceeded at a steady rate throughout the 1970s and 1980s with the average rate of deliveries over this period being nine ships per year. Significant growth in the cruise markets has seen the market grow significantly in recent years, with the average rate of deliveries in the five years between 1989 and 1993 being 18.6 ships per year.

- The market for large cruise vessels has grown particularly strongly. The following table estimates the average annual growth rates for each sector over the period 1989 to 1993:

GRT	Average Annual Growth Rate
<5,000	2.9%
5,000-10,000	**3.1%**
10,000-20,000	**3.9%**
20,000-50,000	**4.2%**
50,000+	11.8%

- The large sector is very much in a growth phase, although it should be kept in mind that even high growth rates in this sector generate only a fairly small number of contracts : this is a small niche market sector. The average rate of deliveries by sector over the five years 1989 to 1993 was as follows:

GRT	Average Deliveries per Year 1989 to 1993
< 5,000	6.6
5,000-10,000	3
10,000-20,000	3.8
20,000-50,000	3
50,000+	2.4

- The rate of growth appears to show no signs of slowing. At present there are 59 passenger ships on order.

- The US is the largest single owner of passenger ships, with 17% of the fleet. Of the US owned fleet, only 11 ships are US registered with the remaining 70 vessels registered outside the USA. Other main owning blocks are as follows:

USA	:	17%
Canada	:	5.4%
Japan	:	6.7'%
Europe	:	22.5%
Indonesia	:	5%
Russia	:	4.6%

There are good opportunities for export orders within these nationalities, but it should be noted that much construction is undertaken in established specialist builders, in particular in North West Europe.

Figure 5.14a : CURRENT FLEET- PASSENGER

DISTRIBUTION BY NUMBER OF SHIPS

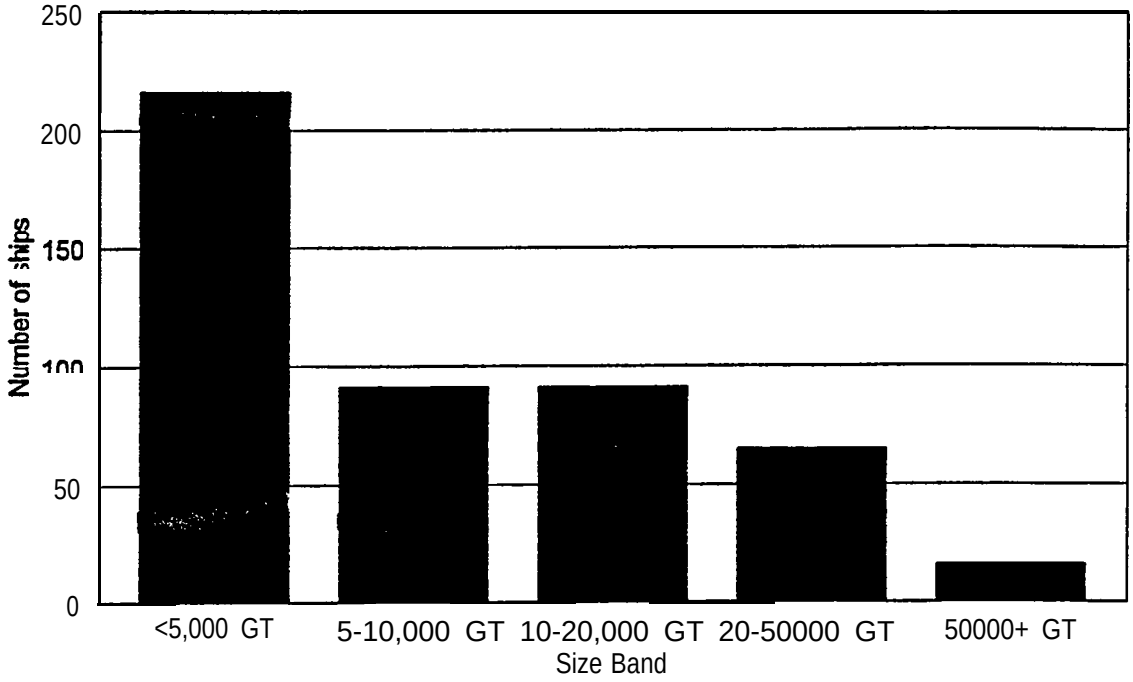


Figure 5.14b : CURRENT FLEET - PASSENGER

DISTRIBUTION BY GROSS TONNAGE

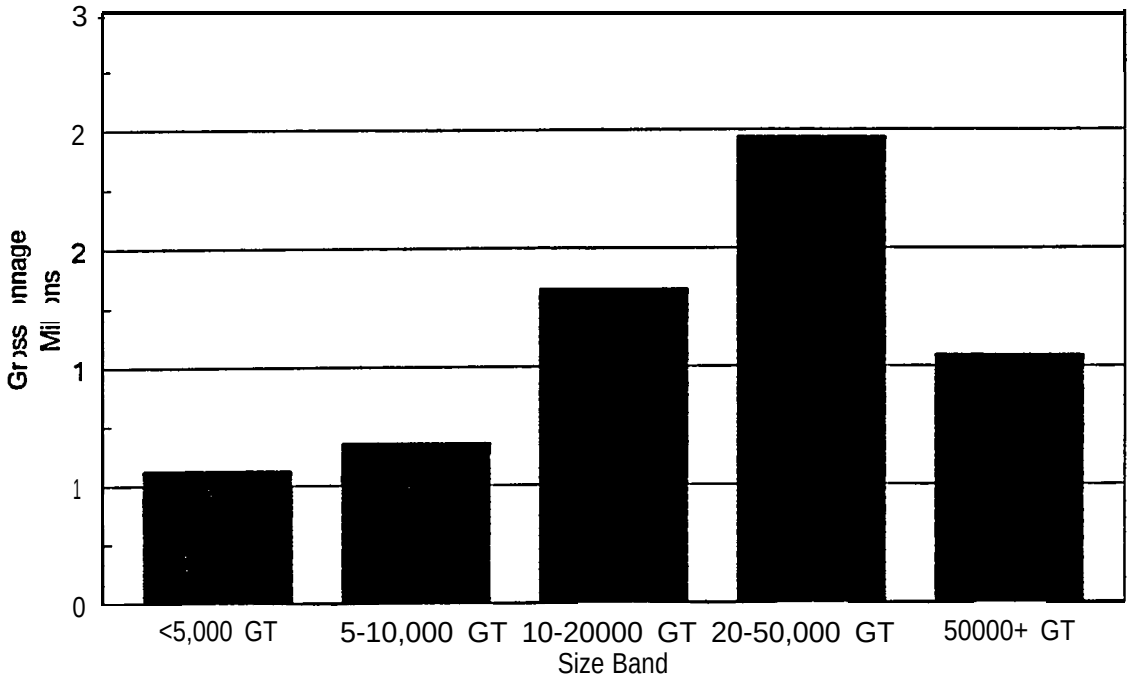


Figure 5.14c : DISTRIBUTION BY AGE - PASSENGER SHIP

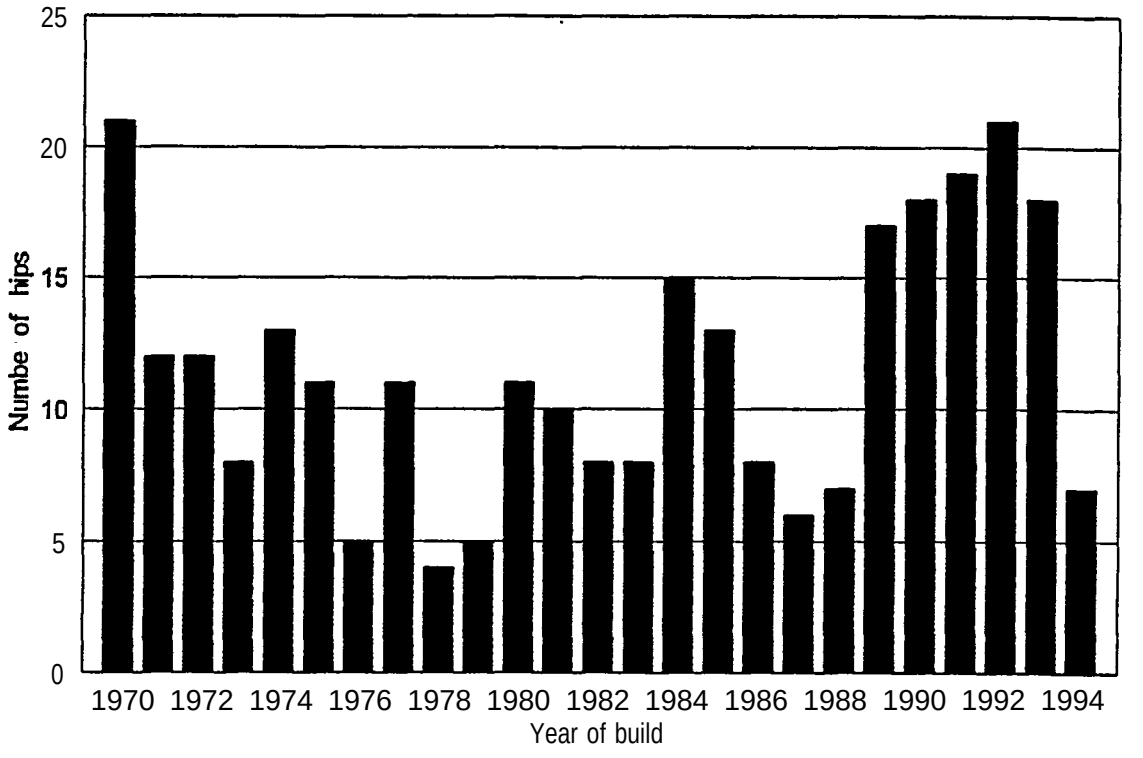
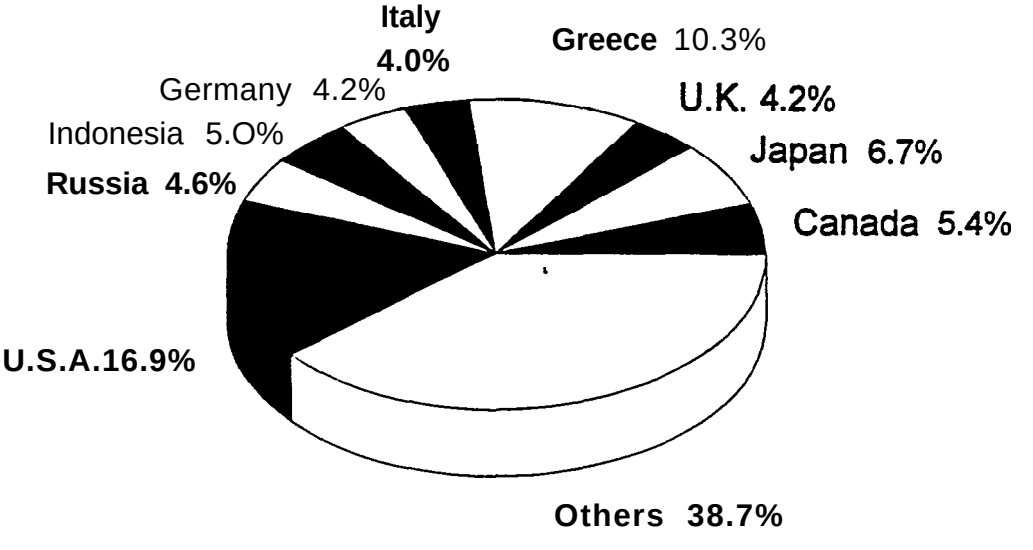


Figure 5.14d : OWNER NATIONALITY - PASSENGER SHIP



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5.14 CARGO RORO

- Figures 5.15a to 5.15e illustrate details of the current RoRo fleet.

- The fleet of cargo roros numbers 1,207 ships. These are predominantly under 20,000 gross tonnes with the distribution being as follows:

Gross Tonnage	Number of Vessels
<5,000	648
5,000-10,000	244
10,000-20,000	209
20,000-40,000	99
40,000+	7

- The average age of the fleet is 14 years, with the greatest period of development between 1977 and 1980. The peak rate of deliveries was 122 ships delivered in 1979. A smaller secondaw peak of deliveries was seen in the first half of the 1980s but in general terms the fleet is in a mature phase. The average rate of deliveries per annum in the five years between 1989 and 1993 was 25.8 ships per year. The current order book reflects this rate. The estimated average rate of growth over the five years 1989 to 1995 were as follows:

Gross Tonnage	Average Annual Growth Rate
<5,000"	1.23%
5,000-10,000	3.54%
10,000-20,000	2.98%
20,000-40,000	1.55%
40,000+	0

The rate of growth of the smaller and larger sectors of the fleet have been particularly slow.

The nationality of ships is fairly widely spread. This is an important sector in the United States, with 7.9% of the fleet, in second position behind Japan with 8.2%. Western Europe is also a significant owner of roro ships, and as with other sectors of the fleet domestic order preferences will restrict the availability of orders to some extent. Much of the market is open however, and would be available for export orders. The main owner blocks are as follows:

Japan	:	8.2%
USA	:	7.9%
Europe	:	30.6%

Of the USA owned fleet, 63 ships of the 95 are registered in the USA.

Figure 5.15a : CURRENT FLEET- RO-RO

DISTRIBUTION BY NUMBER OF SHIPS

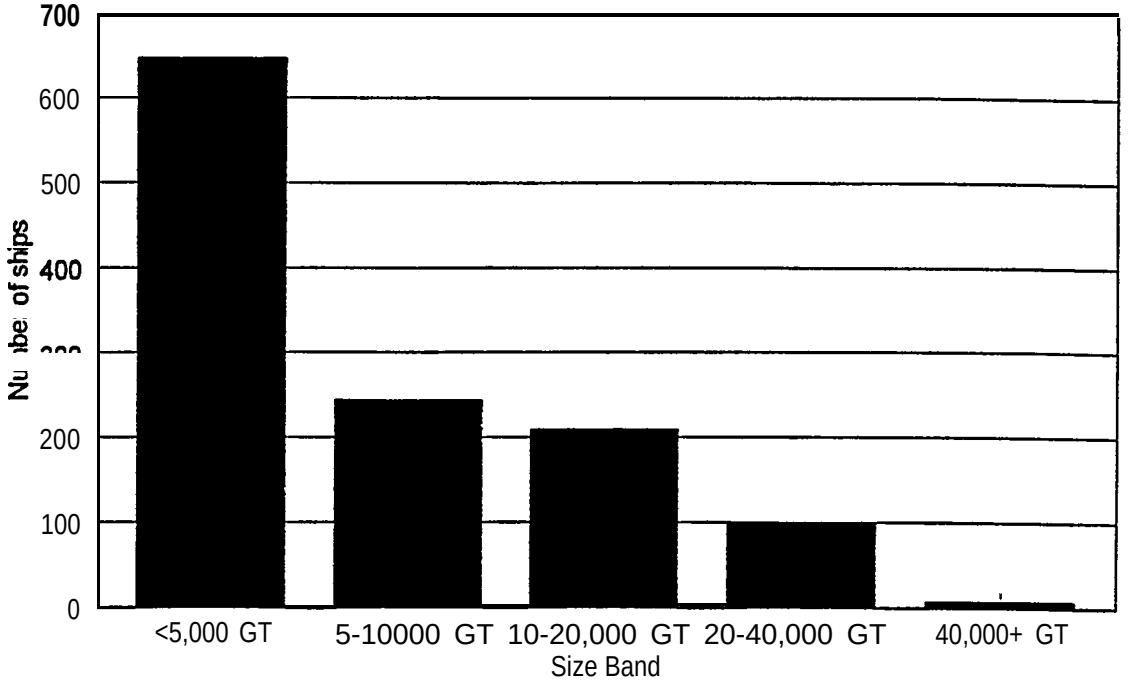


Figure 5.15b : CURRENT FLEET= RO-RO

DISTRIBUTION BY GROSS TONNAGE

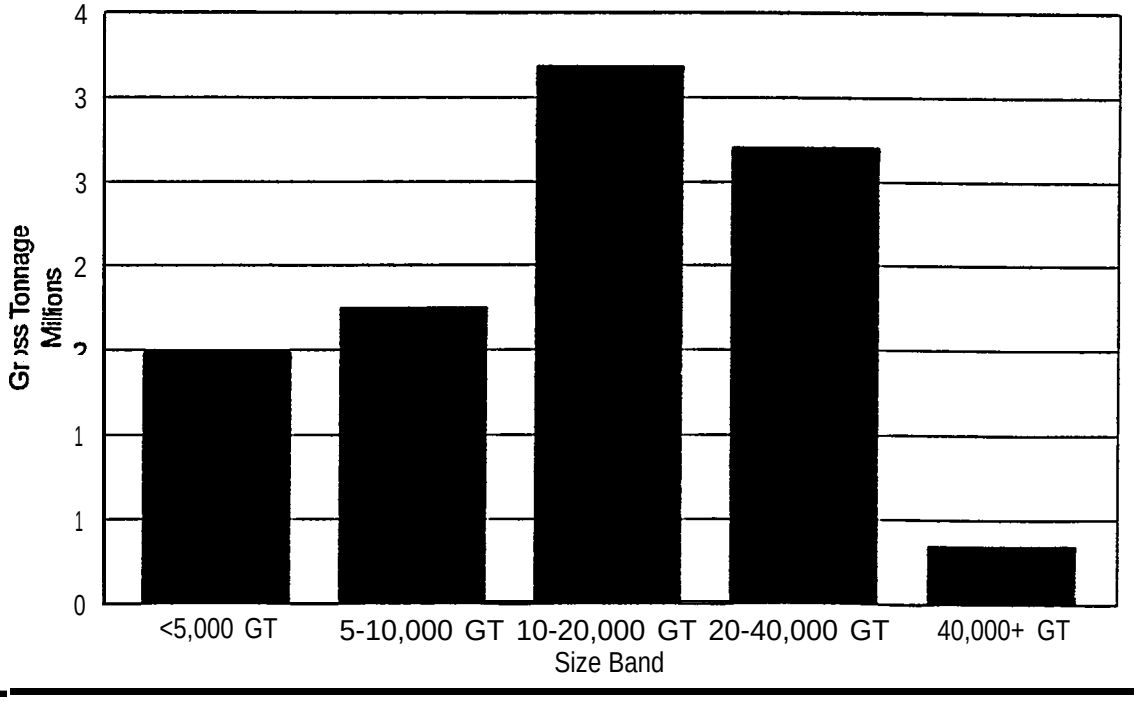


Figure 5.15c: DISTRIBUTION BY AGE - RO-RO SHIP

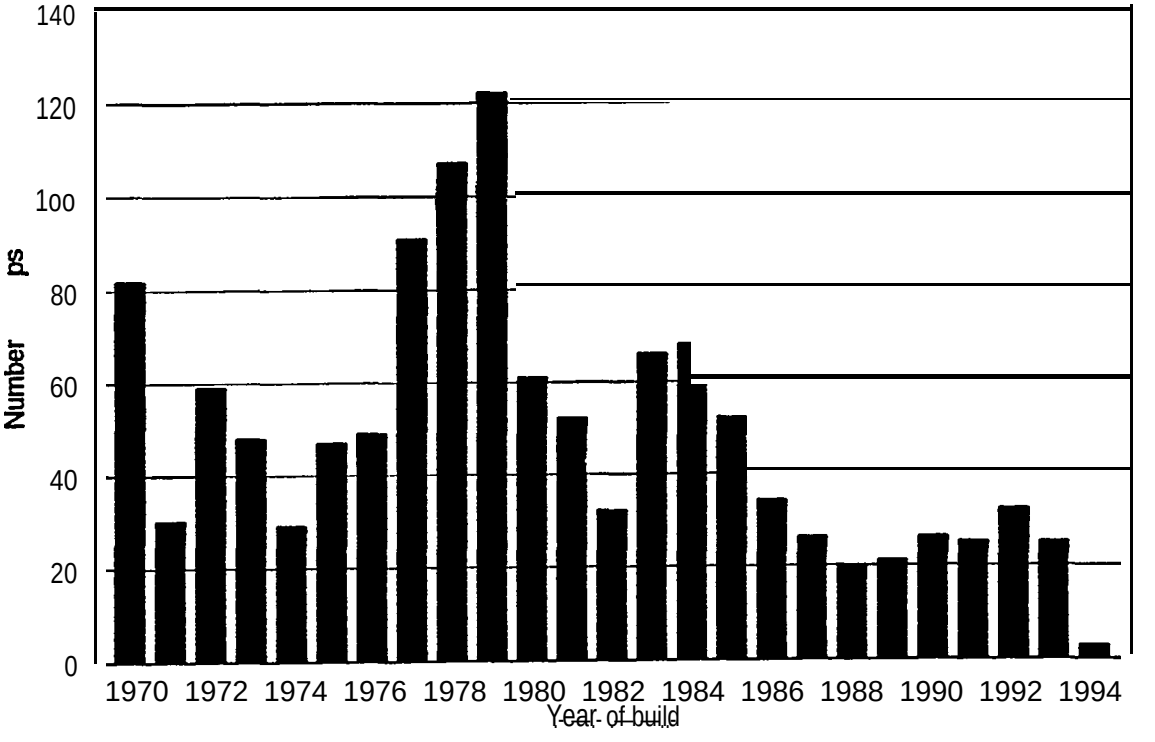


Figure 5.15d : OWNER NATIONALITY-RO-RO SHIP

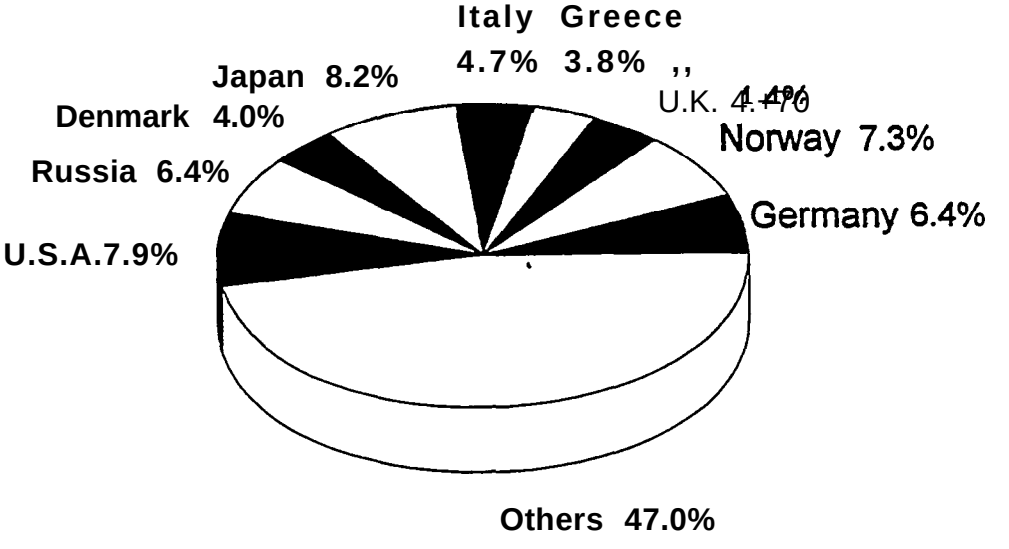
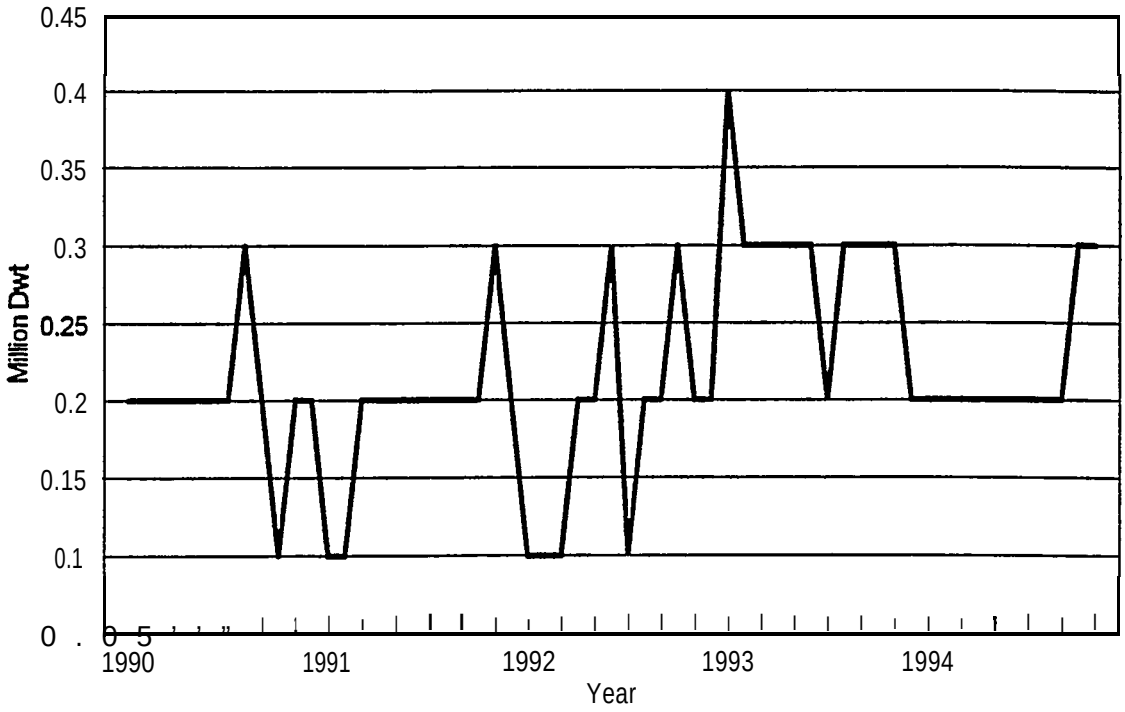


Figure 5.1 5e : RO/ROS TOTAL SURPLUS



Source :Lloyds Shipping Economist

5.15 CAR CARRIERS

- Figures 5.16a and 5.16a illustrate details of the current car carrier fleet.

- The vehicle carrying fleet numbers 452 ships, with size distribution as follows:

Gross Tonnage	Number of Vessels
< 5,()()()	112
5,000-10,000	79
10,000-20,000	83
20,000-40,000	71
40,000+	107

- The average age of the fleet is fairly low at 11 years, although the large car carrier fleet is significantly younger as demonstrated by the following statistics:

Gross Tonnage	Average Age
<5,000	13
5,000-10,000	13
10,000-20,000	14
20,000-40,000	10
40,000+	7

- The fleet developed strongly through the 1980s but has now achieved a mature profile. The development phase finished around 1987/88. The average rate of delivery between 1980 and 1987 was 31 ships per year. Since that point it has been 12 per year.

- The estimated annual growth rates over the five years from 1989 to 1993 were as follows:

Gross Tonnage	Annual Average Growth Rate
< 5,(300	3.33'%
5,000-10,000	2.4%
10,000-20,000	0.5%
20,000-40,000	1.36%
40,000+	2.66%

- There is no indication yet of any increase in ordering rates, with the order book for vehicle carriers currently standing at 15 ships.

- The ownership of car carriers is strongly related to car producing countries and as would be expected is dominated by Japan with 56.4% of the fleet. European owners are also strongly represented, with ownership blocked as follows:

Japan		56.4%
Europe		18.7%
Hong	Kong ;	3,3%
USA		2.2%
South	Korea :	4.9%
Singapore	:	1.5%

Of the USA owned fleet, all ships are registered in the USA.

Due to domestic ordering preferences, much of this market is likely to be closed to exporters.

Figure 5.16a : CURRENT FLEET - CAR CARRIER

DISTRIBUTION BY NUMBER OF SHIPS

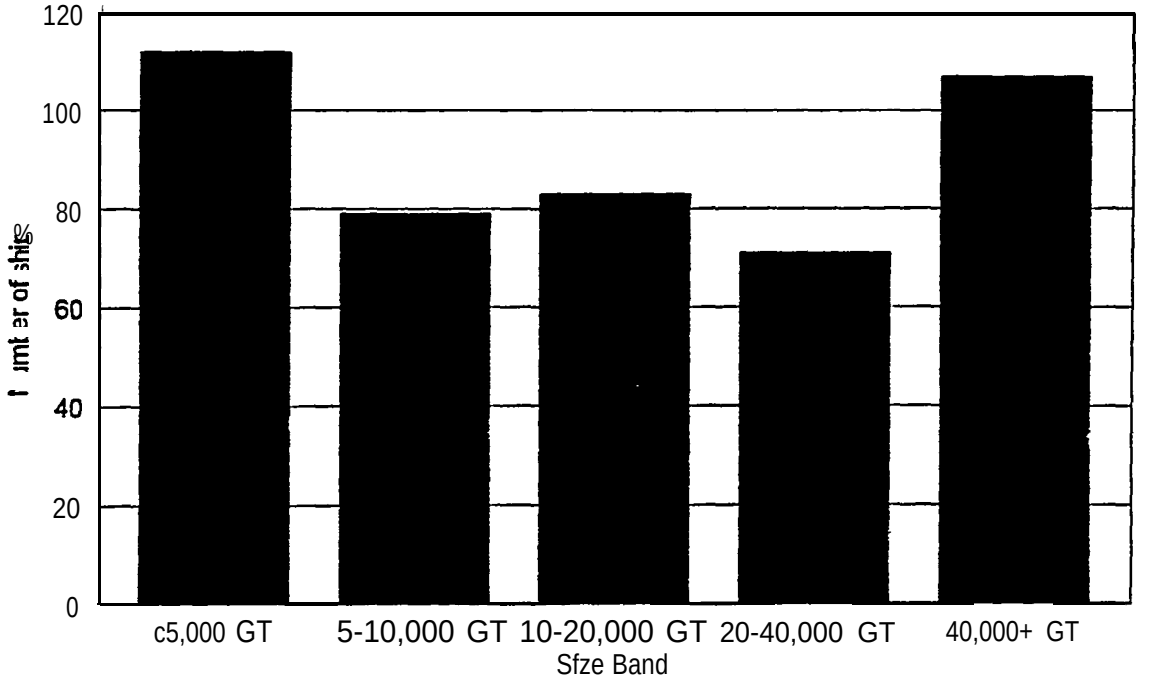


Figure 5.16b : CURRENT FLEET - CAR CARRIER

DISTRIBUTION BY GROSS TONNAGE

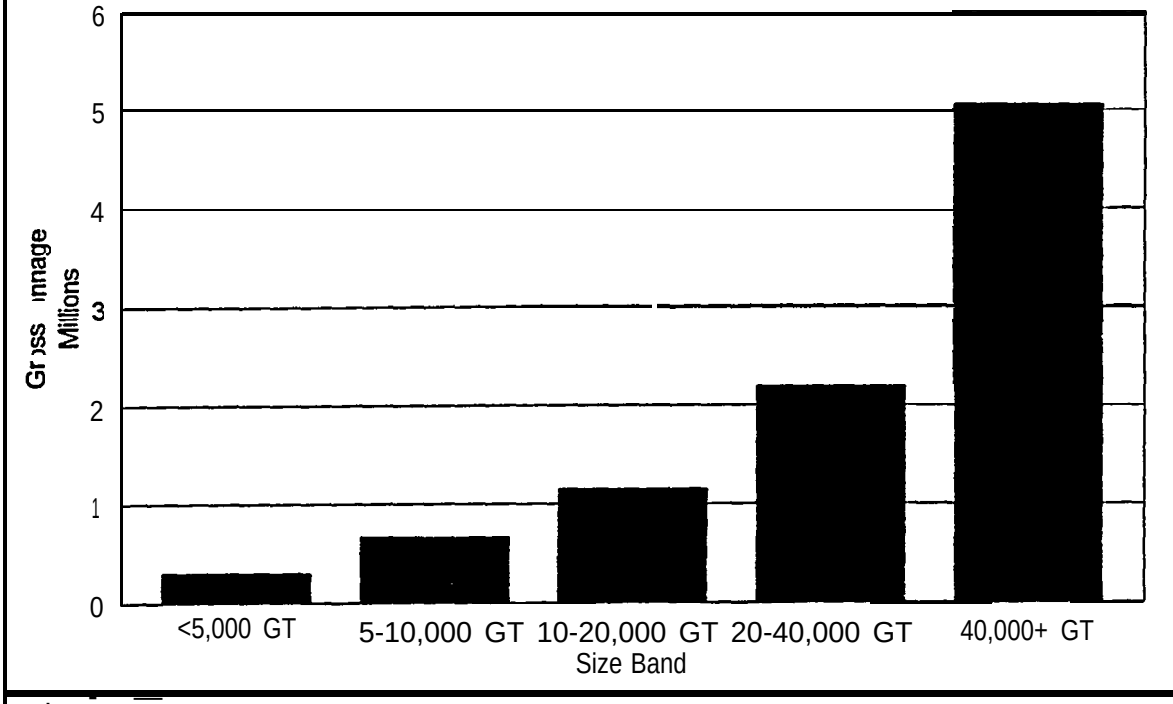


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Figure 5.l6c : DISTRIBUTION BY AGE - CAR CARRIER

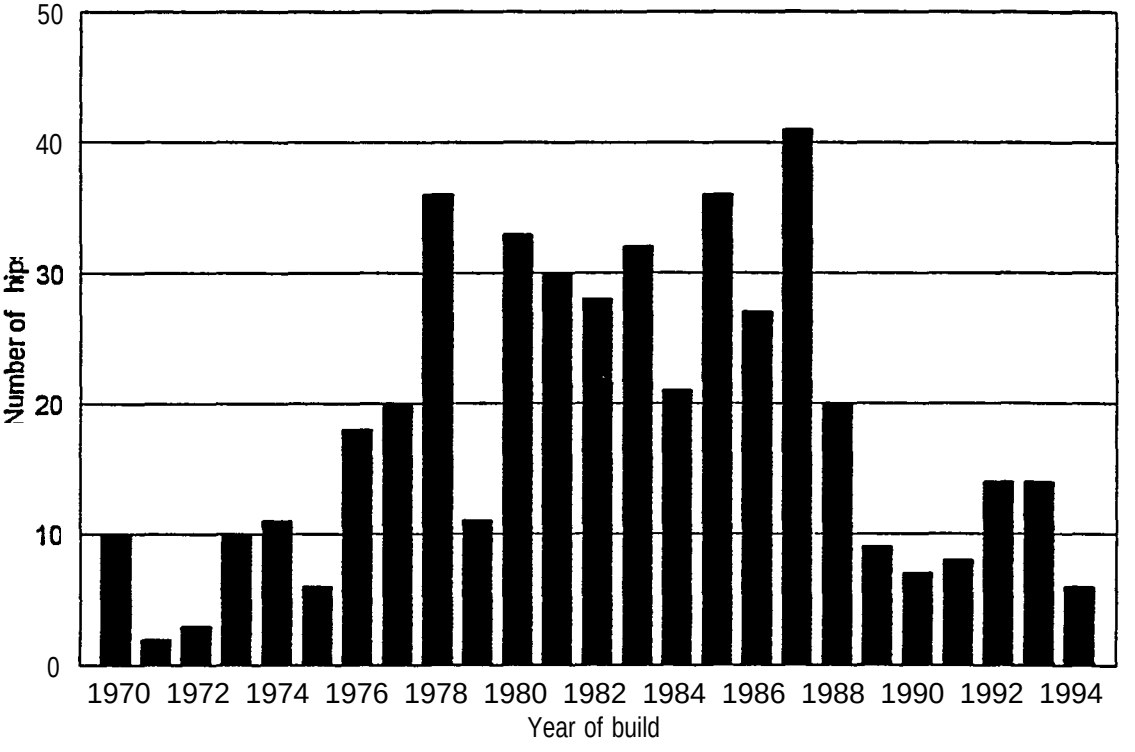
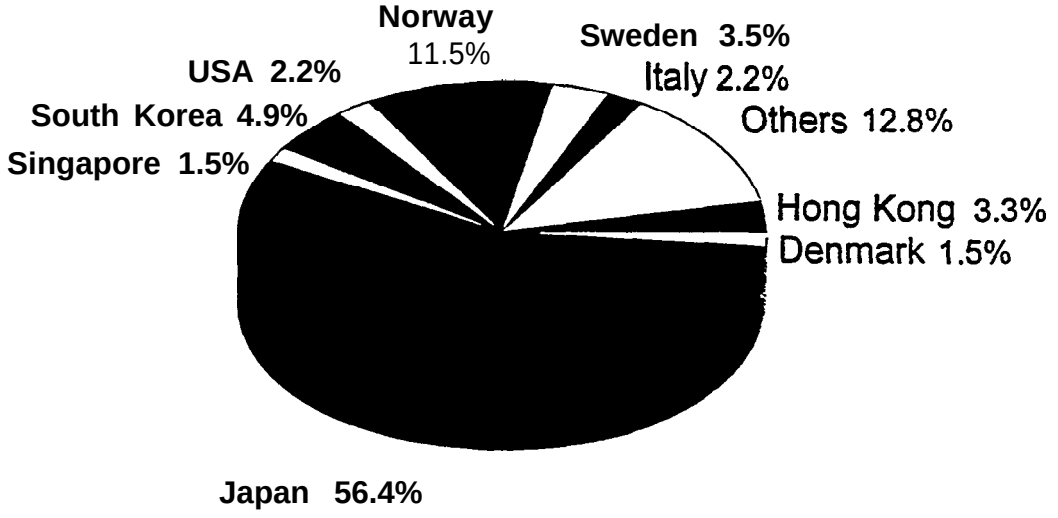


Figure 5.16d : OWNER NATIONALITY - CAR CARRIER



6. FORECAST TRADE GROWTH AND FLEET GROWTH FORECASTS

6.1 INTRODUCTION AND BACKGROUND

The demand for ships stems from the demand for moving goods around the world by way of trade. In this respect, growth in trade leads to a need to increase cargo carrying capacity, although given that there is elasticity in the system through fleet surpluses, and the relationship is not direct.

The following chapter aims to examine broadly the key market dynamics behind world trade as they relate to the various fleet sectors, and to look at forward potential. In a number of cases the relationships are fairly straightforward, with direct links between a ship type and its trade (for example, oil). In other cases, the link is less direct, as, for example, between the reefer trades and economic performance. In detail, the system is hugely complex. All sectors react to micro-economic, political and local factors, examples being:

* EEC sanctions on bananas have lead to marked problems in reefer trades.

· The Gulf War lead to massive increases in freight rates for tankers.

· Crop dynamics in North America have a marked effect on demand for bulk carriers.

· The opening of the Channel Tunnel has had a marked effect on the demand for and type of ferries and roros in the Channel and North Sea areas.

These are examples of localized effects (either in terms of time or geography) that effect global shipping; there are many more at all levels that ultimately effect shipbuilding demand to a greater or lesser extent.

The chapter studies global trade and economics, looking at the historical pattern and such forecasts as are available; unfortunately very few forecasting bodies forecast for longer than the short term, due to the vagaries of global economics. The problems are outlined in the following quotation from the OECD, relating to that organization's "Medium Term Reference Scenario", effectively an outlook for the period 1997 to 2000:

> "Such a reference scenario is not a forecast but represents one of many possible projections which may be considered more or less likely. It is highly conditional on a number of key assumptions and judgments about economic policies and events and, insofar as these turn out to be wrong, it will be less appropriate as a central case".

This disclaimer precedes the OECD'S view of what may follow the short term forecast covering the period to 1996, and describes well the limit to any forecast.

6.2 WORLD TRADE

Figures 6.1 and 6.2 present the growth of seaborne trade in terms of volume and tonne miles between 1975 and 1993.

The average annual rate of growth in the five years up to 1992 was 4% per annum in terms of volume and 5% per annum in terms of tonne miles. It is interesting to compare this with the growth in the capacity of the fleet (in terms of GRT) over the same period, with an annual average rate of 2% shown. This is due both to over-capacity in the fleet and the fact that new ships are inherently more efficient than older tonnage, giving a greater cargo carrying capacity per gross tonne.

Approximately 60% of world seaborne trade is generated by five trades, with the following percentage shares in terms of volume in 1992:

Crude Oil	31%
Oil Products	8%
Iron *Ore*	8%
Coal	8.8%
Grain	4.8%

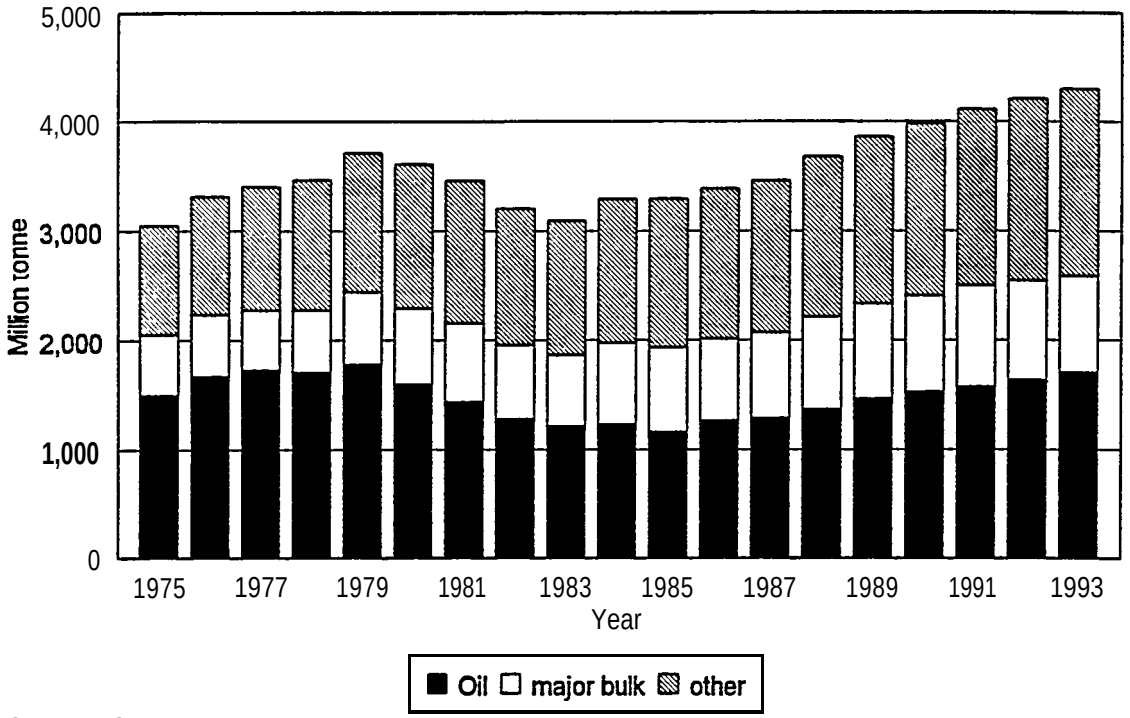
These refer to the two main constituents of trade; oil trades and the major bulks. Other commodities include minor bulks, general cargo (including containerized cargoes), gas, chemicals, food and other specialized cargoes.

In general terms, the growth of trade has been reasonably steady, with the exception of crude oil, which has shown very marked fluctuations; in particular a significant decline in trade between 1979 and 1983, with a fall of around 38%. This lead to the overall fall in trade seen in that period.

The volume of trade is currently roughly equal between the oil trades and the major bulks, but this has not always been the case. Trade grew very strongly through the 1960s and 1970s, with an average annual rate of increase in volume of 6.3% between 1963 and 1979. Crude oil trades rose particularly strongly in the period up to the first oil shock in 1973, with an average annual rate of growth of 11.5% in this period. By 1973 the relative volumes of trade were 1.87 billion tonnes of oil and associated trades (the peak in that sector), and 1.35 billion tonnes of dry cargo; oil trades were 40% greater by volume than the dry cargo trades.

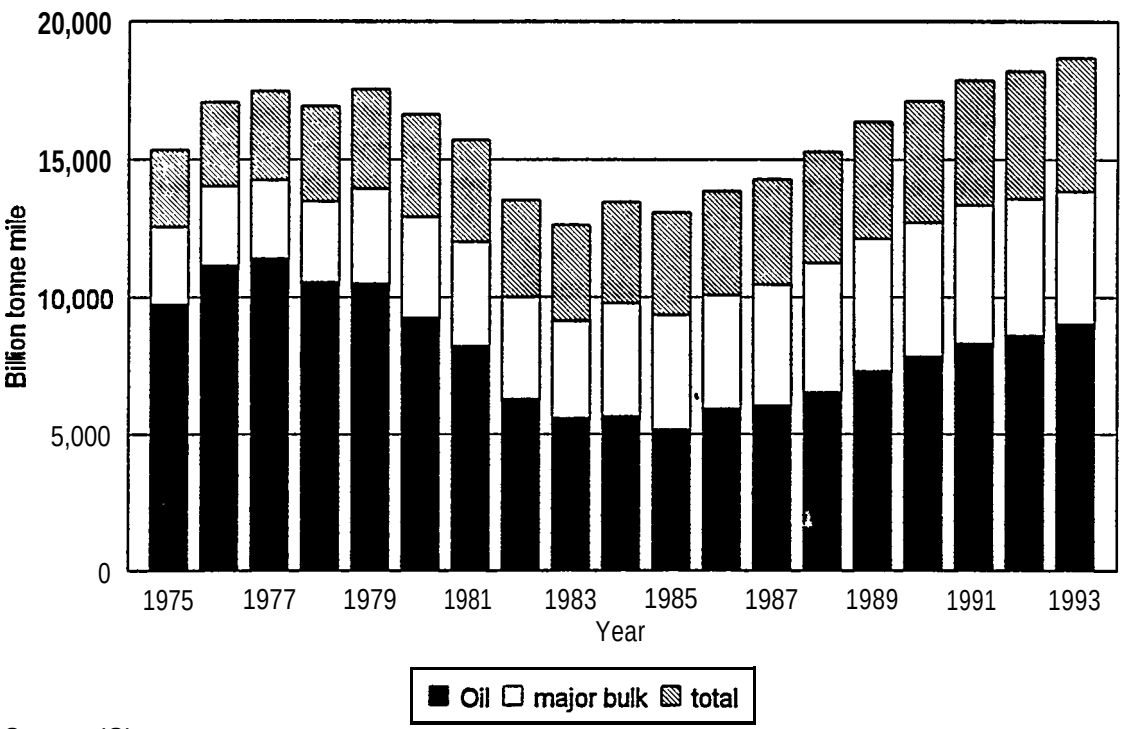
The oil shock of 1973 saw a significant turndown in the rate of growth of oil trades, leading ultimately to a period of significant decline, as indicated above.

Figure 6.1: SEABORNE TRADE (VOLUME IN TONNE)



Source: ISL

Figure 6.2: SEABORNE TRADE (VOLUME IN TONNE.MILES)



Source: ISL

Dry bulk trades and other trades have generally been more resilient than crude oil trades, showing fairly steady growth over the period 1975 to 1993, although all sectors showed some decline in recessionary times around the start of the last decade. The average annual growth rate in the period 1975 to 1993 for the main trade sectors was as follows:

Sector	Average Annual Growth Rate in Trade Volume (1975 to 1993) .
Crude Oil	0.35%
Oil Products	2.41%
Total Oil Cargoes	0.720%
Major Bulk Cargoes	2.62%
Other Cargo Sectors	3.05%
Total All Trades	1.93%

These factors are lead by a number of overlying developments in global trade, that will have a marked effect on future trade patterns, and that must be taken into account in this study. These are as follows (as identified by the World Bank in the discussion paper "The Maritime Crisis").

- The Globalization of Manufacturing Processes : In particular amongst OECD industries, the search for lower costs to improve competitiveness has lead to out-sourcing of intermediate manufacturing and assembly tasks and a survey by the World Bank has projected expansion of this effect, leading to a reduction in long haul primary commodity movements, and an increase in smaller high value shipments, This in turn will lower demand for large bulk carriers, but increase demand for container and multi-purpose trades. The current performance of the Yen will fuel this change, with Japan being the leader in this shift at this time.

- Changes in Production Techniques and Organization : In effect, the fragmentation of industrial processes has lead to the integration of the transport system into the industrial process. Japanese car manufacturing practices in Europe and North America are a good example of this, requiring high speed dedicated transport facilities. However, the traditional shipment of finished goods (for example, cars), will correspondingly decline.

- Integration of Regional markets : There is a growing trend towards increasing intra-regional trade, leading to an increase in short sea transport over long haul trades. Lead by NAFTA and the EU, but in the future including probably a Pacific rim block also.

- Value Adding at Source: Stemming from the aim to obtain better income from indigenous products by shipping in a processed rather than raw state. The best example is the trend for OPEC countries to ship refined products rather than crude oil, leading to lower parcel sizes and the need for more handysize/handymax ships. Similar trends are expected in the mining and ore trades, with the shipment of smaller quantiies of processed commodities.

- Conservation : The reduction in oil consumption following the oil shocks is the best example of this phenomenon; Japan was able to reduce its oil consumption by 50% in the period following the oil crisis of the mid 1970s. The effects will also be felt in other commodities.

- Environmental Concern : In particular, pressure against oil and coal and the effects that burning these fuels has on the global atmosphere, has lead to searches for other fuel types, and in particular the increasing use of LNG in national energy policies, and the consequent increase in demand for this product over traditional fuels.

An examination of these factors lead to the following medium term (currently up to 2000 in most forecasts) forecast for growth in trade up to the year 2000:

	Volume **Changes (Average Annual Percentages)**	
Category	1985 **to 1990 Actuals**	**1990 to 2000 Projections**
Major Bulks	2.8	1.6
Petroleum	5.6	1.7
(of which) Crude Oil	6.1	1.2
Products	3.1	3.5
Minor Bulks	1.5	1.6
All Dry Bulks	2.4	1.7
General Cargo	4.7	5.5
Total Seaborne Cargo	**3.9**	**2.6**
[Source: "The **Prospects** for Seaborne **Bulk Trades", Hans J Peters,** The World Bank]		

These projections assumed that the recessions seen in world economies in the early 1990s would "bottom out" in mid-decade, which has been the case. A number of important features are outlined in this table, as follows:

- In general terms, the rate of growth of trade is projected to slow down, although maintaining a steady moderate rise.
- A significant downturn in the growth of crude oil trades (although with slow growth maintained), and a steady increase in shipment of products.
- A slight downturn in the growth of dry bulk trades, although most marked for the major bulks, having the greatest effect on panamax, cape size and VLBC tonnage.
- The effects of these changes in both the oil and dry bulk trades will be to reduce the rate of increase in demand for larger tonnage, and increase the proportion of cargoes carried in smaller and in particular handysize tonnage.
- General cargo trades (moved in the main in container, roro and general cargo/multi-purpose ships) will see an increase in the rate of growth, based on the trends outlined above.

Due to the effects of the global economy, and the poor state of the OECD nations at the start of the decade, the rate of growth in these projections is forecast to be better in the second half of the decade than the first, as shown by the following average rates over two five year periods:

	Growth in Trade Volume (Average Annual Percentage)
1990 to 1995	1.6%
1996 to 2000	2.9%

The average annual increase in tonnage, based on this forecast of trade growth, is small at 1.13% per year - 50% of the level of trade growth, again reflecting the increasing efficiency of new tonnage and the need to reduce capacity to some extent. The average annual projected growth in deadweight tonnage over the two periods shown is as follows:

	Growth in Fleet Deadweight (Average Annual Percentage)
1990 to 1995	0.58%
1996 to 2000	1.67%

These statistics provide the background (along with the economic assumptions outlined in the section hereafter) on which the following forecasts by ship types are based. This is only one of a number of forecasts however, that could possibly be examined, although all tell very much the same story.

The greatest problem lies in trying to forecast beyond the medium term, which many forecasters (certainly such as the OECD or World Bank) are reluctant to do, for the reasons outlined above. In general terms, it is only possible to speculate on a relative direction. in effect to address the question what if the following five year period (after the year 2000) is equivalent to, or better or worse than the preceding five years, within reasonable bounds. Notwithstanding this, the potential for major changes of direction remains. For example, it is not inconceivable that increasing dependence of major oil importing countries (Europe, Japan, USA and East Asia) on OPEC suppliers could lead to a third oil shock at some point over the next decade. At this time this is not, however, predictable.

In this context, it is worth reviewing the forecasts made by the Shipbuilders Association of Japan and the Association of West European Shipowners, in their forecasts to 2005. [n both cases, as with the World Bank's view, the performance of the global economy is forecast to improve in the second half of the decade (see Tables 6.1 and 6.2). The trade indicators given (covering the medium term only) show moderate growth only however, again reflecting the World Bank assumptions.

In summary, the above discussions highlight a number of trends that will be taken into account in forming assumptions in the following forecast. These are as follows:

- Global economic performance will improve in the second half of this decade (this is discussed in the following section of this report). In the longer term, beyond 2000, it is assumed that growth will slow to some extent (by the cyclical nature of economics), although a number of potential scenarios will be taken into account.

- Only moderate trade growth is anticipated over the forecast period.

- Due to a need to improve fleet balance and the improved efficiency of new ships, the rate of increase of fleet capacity will be significantly less than trade growth.

- The pattern of trade will continue to change, as outlined earlier in this section. The net effects are the increasing preference of transport of value added materials, resulting in a reduction in the demand for larger tonnage (tankers and bulkers), and increasing general cargo volumes.

Table 6.1

COMPARISON OF SAJ AND AWES FORECAST PARAMETERS

Parameter	Period	AWES	SAJ
'(1) GNP Growth			
OECD	1881-1885	2.50%	2.00%
	1895-2000	2.70%	2.70%
	2000- 2005	2.70%	2.60%
World	1881-1885	2.20%	1.70%
	1895-2000	3.00%	2.80%
	2000-2005	2.80%	2,80%
(2) Primary Energy Consumption (Million T OEU)			
OECD	1995	4,216	4,183
	2000	4.451	4,442
Average Annual Growth Rate		[illegible]	1.16%
(3) Oil Consumption (Million T)			
OECD	1985	1815	1776
	2000	1865	1840
Average Annual Growth Rate		0.54%	0.71?4
World	1995	3305	3241
	2000	3505	3487
Average Annual Growth Rate		1.18%	1.47%
I(4) Oil SeaborneTrade			
Million Tonnes	1995	1625	1673
	2000	1765	1834
Average Annual Growth Rate		1.67%	1.85%
8 Million Tonnes	1995	8210	8616
Miles	2000	9255	8489
Average Annual Growth Rate		2.43%	-0.34%
Avenge Journey	1995	,052	5,150
Length (miles)	2000	5,244	4,618
(5) Steel Production			
Million Tonne	1995	795	736
	2000	820	790
Average Annual Growth Rate		0.62%	1.43%
(6) Major Bulks Seaborne **Trade**			
Million Tonnes	1995	1042	1037
	20W	1096	1122
Average Annual Growth Rate		1.02%	1.59%
Billion Tonne=	1995	5653	5742
Miles	2000	5946	6262
Average Annual Growth Rate		1.02%	1.81%
Average Journey	1995	5,425	5,537
Length (miles)	2000	5,425	5,599
(7) Minor Bulks and Other Dry Cargo			
Million Tonnes	1995	1230	1126
	2000	1393	1262
Average Annual Growth Rate		2.52%	2.31%

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Tab e 6 2

Analysis Of World Bank Projections For Trade and Fleet Growth

(Source: The Maritime Crisis, Hans J Peters)

Year	Seatrade Volume (Billion Tonnes)	% Growth	Total Tonnage Required (Million Dwt)	% Growth	Ratio of% Growth: Volume: Dwt
1990	**4.00**	**-**	**658**	**-**	
1991	4.05	1,25%	673	2.28%	182.37%
1992	4.10	1.23%	657	-2.38%	-192.57%
1993	4.17	1.71%	667	1.52%	89.15%
1994	4,25	1.92%	672	0.75%	39.07%
1995	4.33	1.88%	677	0.74%	39.53%
1996	4.42	2.08%	680	0.44%	21.32%
1997	4.52	2.26%	683	0.44%	19.50%
1998	4.66	3,10%	690	1.02%	33,09%
1999	4.81	3.22%	707	2.46%	76.54%
2000	-5.00	3.95%	735	3.96%	100.26%
Average Over Period		**2.26%**		**1.13%**	**49.78%**
Average 1990 to 1995		**1.60%**		**0.58%**	**36.51%**
Average 1996 to 2000		**2.92%**		**1.67%**	**57.05%**

6.3 THE GLOBAL ECONOMY

In general terms, world trade, and the performance of trade, follows the fortunes of the World economy, albeit with something of a lag. In rough terms, trade lags the effects of economic fortune by about one year, and the effects on the fleet will be felt about one year after that. In other words, economic movements experienced over 1994 are likely to be felt in shipyards in 1996.

By the end of 1994, the OECD reported that generally speaking OECD economies have come out of recession, with a generally positive outlook for the future. Forecasts of the main economic parameters for 1995 and 1996 are positive. The OECD Economic Outlook at December 1994 notes in particular that the conclusion of the Uruguay Round and the coming transformation of GATT into the World Trade Organization are potentially very positive events for the world economy, providing that they are ratified.

Growth in the OECD area (in terms of GDP) was around 2.75% in 1994, and' is expected to grow to around 3'% in 1995 and 1996. This is accompanied by low inflation and falling unemployment. The recovery is not without risk however, and concern remains over the resurgence of inflation and financial excess.

In the medium term reference scenario (see above), the OECD envisage a moderate level of improvement continuing over the rest of this decade, as follows:

OECD
GDP Growth Rates

1994	2.8%
1995	3.0%
1996	2.9%
1997 to **2000**	**2.9%**

Outside the OECD, East Asian economies are growing at a high rate, further adding significantly to global economic activity, as indicated in the following table

Table 6.3

EAST ASIAN ECONOMIC GROWTH

	Percentage Growth in GDP		
	Asian NIEs *	**Asean Total ** **	**China ***
1990	6.9	8.1	4.1
1991	7.4	6.6	8.0
1992	5.6	6.2	13.2
1993	6.1	6.7	13.4
1994	7.1	7.3	11.5
1995	6.9	7.7	9.0

* **Newly Industrialized Economies: South Korea, Taiwan, Hong Kong, Singapore**

** **NIEs plus Thailand, Indonesia, Malaysia, Philippines**

*** **China measured by GNP, not GDP**

Source: Japan Maritime Research Institute

It can be seen that despite some slowdown in China's rate of growth. the performance of its economy is still very buoyant, although with ever present danger of over-heating, as is the case throughout much of Asia. Newly emerging economies, such as Vietnam, will further add to this growth.

Elsewhere outside the OECD, former Eastern Bloc economies and in particular Former Soviet Union, have performed less well. The exception to this is Poland, with a positive growth seen in the economy, which is expected to continue.

in light of these improvements in the world's economy, the OECD sees a corresponding growth in trade, and world trade picked up sharply in 1994. Recent performance and forecasts are as follows:

Growth in World Trade
(Annual Growth Rates)

1993	**3.2%**
1994	**8.9%**
1995	8.2%
1996	7.8%

(Source: OECD)

It should be noted that these statistics refer to trade in total, including all forms of transport, not only sea transport. In fact, of importance to seaborne trade, the OECD notes a gradual decline in the importance of primary commodities, as shown by the following statistics:

Consumption as a percentage of OECD GDP

	1972	**1982**	**1985**	**1992**
Oil	1.1	5.1	3.6	1.3
Selected non-Oil* Commodities	1.2	**0.7**	**0.7**	**0.4**

•Aluminium, copper, tin, nickel, lead, zinc, sugar, coffee, cocoa, tea, cotton, rubber, wood.

Thus, whilst trade is rising sharply, the seaborne element (primarily merchandise) is generally rising more slowly, as invisible trade (services and investment) gathers momentum, as indicated by the following statistics:

	Percentage of Total World Trade					
	Credits			**Debits**		
	1975	**1985**	**1993**	**1975**	**1985**	**1993**
Merchandise	75.1	70.9	66.2	73.9	68.7	64.6
Services	17.1	16.6	18.4	18.8	16.9	18.8
Investment	7.8	12.6	15.2	7.3	14.4	16.6

Source: OECD Economic Outlook

OECD trade accounts for about 60% of the world total, but by far the greatest growth is in what the OECD refers to as Dynamic Asian Economics (DAEs), that is to say Korea, Taiwan, Hong Kong, Singapore, Malaysia and Thailand.

The growth in merchandise trade expected from these countries, compared to world trade as a whole, is as follows:

Percentage Growth (merchandise)

	1993	1994	1995	1996
World Trade	3.2	8.9	8.2	7.8
DAEs	10.4	11.1	11.6	11.4

The OECD economic outlook at the end of 1994 also noted a number of other important changes in the geographical pattern of world trade, in addition to other structural changes. The key elements are as follows:

OECD area countries dominate world trade, accounting for about two thirds of world imports and exports.

- European trade is the largest element of this, although this is gradually diminishing, at about 60% of OECD trade. 27% is intra-European trade.

- OECD trade is characterized by a rising degree of intra-regional trade. This is partly due to formal trade agreements, but also to other factors independent of these agreements, including geographical proximity and economies of scale.

- Outside the OECD area, there has been a major re-distribution of both imports and exports. Prior to 1986, OPEC countries constituted the largest non-OECD exporting block, with central and eastern Europe and African countries ranking amongst the largest importers. Since then, OPEC's importance has substantially diminished for reasons outlined earlier. Conversely, very significant growth has been seen in DAEs, whose share in world trade has been increasing steadily, and China has now joined these countries as a fast growing economy.

- The recent past has also seen the collapse of central and eastern European countries, although the effect of this on global free trade has been limited, due to the extent of transport integration in former Comecon countries.

The re-distribution of trade has lead to major changes in terms of reduction in the movement of primary commodities, and the increase in movement of manufactured goods, which now account for more than 60% of total trade, an increase from around 25% in 1975.

To summarize these economic factors, the following conclusions are drawn, which in general support the trade outlook presented in the previous section:

- The economic conditions to support a moderate trade growth over the second half of this decade are forecast to be positive.

- Improvements generated from the recovery from the recession in 1994 will be seen in trade growth from 1996 onwards, with relatively strong growth thereafter.

- OECD analysis indicates that intra-region and intra-industry trades are becoming more prevalent and the importance of primary commodities in the world economy is reducing.

- Greatest growth, including in trade, is being seen in a number of dynamic Asian economies.

- Invisibles are growing at a significantly faster rate than merchandise

6.4 FLEET SECTOR FORECASTS

6.4.1 Overview

The preceding sections set out the background to future fleet development, outlining the dynamic forces behind changes in the pattern of trade. In order to model changes at an individual ship type level however, a more detailed review of each sector is needed, taking into account

- Trade growth, and changing trade patterns.
- The state of fleet development (as outlined in section 5 of this study).
- Market conditions, in particular the state of the suppiyldemand balance in the shipping sector.

Each of these factors is outlined for the individual sectors of the fleet below.

6.4.2 Tankers

TRADE FACTORS

- Oil consumption (the driving force behind oil trades) is dependent on economic performance, as well as being susceptible to other forces, such as the oil shocks.

- 0il consumption declined to 3.1 bil!ion tonnes in 1993, down 1% on the preceding year. Following the recoveery in the global economy however, l994 is estimated to show a 2% rise on 1993 and 1995 is expected to show a similar level of rise (Japan Maritime Research Institute forecast).

World Oil Consumption

Year	Consumption (million tonnes)	Percentage Change
1986	**2,898**	
1987	**2,949**	+1.75%
1988	**3,039**	+3.05%
1989	**3,090**	+1.68%
1990	**3,140** “	+1.62%
1991	**3,120**	-0.64%
1992	**3,146**	+0.83%
1993	**3,121**	-0.79%
1994	**3,485**	+2.05%
1995•	**3,240**	+1.73%

•Japanese Maritime Research Institute forecasts

- The anticipated rise to 2000 is only moderate and reflects the proportionate continuing reduction in primary commodity consumption, resulting from increased efficiency and the use of alternative sources.

- The shift away from moving crude oil towards refined products must also be taken into account. The average annual rate of increase in trade volume in the period 1975 to 1992 was 0.5’1% for crude oil, and 2.15% for products. The forecast from the World Bank (see previous section) shows higher growth than this in the period to 2000, but with a similar split by type, at 1.2% per annum for crude oil and 3.59% per annum for products, with a total rate of 1.7%. This is very similar to the rates assumed by SAJ and JAMRI, at 1.67% and 1.85% respectively.

- The effects of this split growth pattern will be reflected in the growth of vessel size classes. Analysis of the split of the fleet by products/crude type shows a cut-off at around 70,000 dwt. Only 4% of products tankers exceed that size, and only 11% of crude cam-era are below this size. The proportion of crude carriers reduces very quickly thereafter, with only 2.5' being below 50,000 dwt. In effect, very few crude carriers are below panamax size. The resulting split by the size classes used in this forecast is as follows:

Dwt	Type
5,000 to **20,000**	Products
20,000 to 50,000	Products
50,000 to 100,000	Predominantly Crude
100,000 to 200,000	Crude
200,000+	Crude

- It must also be remembered that due to increasing efficiency and fleet surplus, fleet growth is expected to be lower than trade growth.

FLEET DEVELOPMENT

- The tanker fleet is in the mature phase, showing low growth of only 1% per annum in the period up to 1992, although in the face of low growth in trade volumes, even this low rate may be too high.

- Contrary to what would be expected, the larger sectors of the fleet have been growing faster than the smaller sectors (see section 5.3 of this study). This is most likely to be due to speculative ordering of replacement tonnage, but accompanied by insufficient scrapping.

  This situation is damaging to the overall prospects for trade recovery and must be avoided to avoid increasing over-capacity, although the temptation to speculate on current low prices against future demand, on the part of shipowners, is understandable.

- Since 1992 however, scrapping of tankers has picked up considerably, and this has restored the balance to some extent

	Tankers Broken up or Lost (million dwt)
1987	8.2
1988	3.2
1989	1.5
1990	1.4
1991	2.9
1992	9.7
1993	12.2
1994	13.3

(Source: Fearnleys)

The effect of very low scrapping rates in the period 1988 to 1992 lead to the distortion noted above. This also lead to increasing surplus in 1993 and 1994, although this was only minor (as discussed below) and is now reducing.

MARKET CONDITIONS

- Fleet surplus (laid up an idle tonnage) has improved considerably since the peak in 1983, when due to speculative over-ordering coupled with a recession laid up tanker tonnage reached around 70 million dwt.

- The total laid up tonnage had reduced by January 1995 to 18.6 million dwt, around 6.5% of the fleet. When slow-steaming and underutilized tonnage is taken into account however, the total surplus rises to 34.9 million dwt, 12.5% of the total fleet **(Source: Lloyd's Shipping Economist).**

- Figure 6.3 shows how the surplus has moved since **1990.** In effect it has remained reasonably constant with the greatest surplus shown in larger ships. The percentage surplus capacity by size of ship at January 1995 was as follows:

Dwt	**'A Surplus Capacity**
10,000 to 40,000	8.8%
40,000 to 150,000	10.2%
150,000+	15.5%

As might have been expected, the amount of surplus tonnage is greatest for the largest ship sizes, above 150,000 dwt.

- Freight rates in the tanker market have remained stable in recent years, following a sharp peak in 1991. Figure 6.4 presents details of world scale rates in the spot market, and Figure 6.5 rates in the period market.

- The current level of freight rates is disappointing and steady increases seen over the second half of the 1980s have faltered due to the effects of new tonnage, delivered without adequate scrapping. (In effect, fleet surpluses are too high), and the disappointing performance of the world economy in the first half of this decade.

It is anticipated that surpluses will reduce and the freight market will improve through changes in the system, due to:

- improved demand
- increased scrapping
- restrained newbuilding.

It is possible that some reduction in fleet capacity may take place as scrapping of tankers reaching 25 years gathers momentum, but no great reduction is anticipated. The 25 year limit placed on ships is most likely to lead to steady replacement demand, rather than a catastrophic peak.

FLEET GROWTH FORECASTS

Based on the above, the following growth forecasts are made from the tanker fleet in the period to 2005.

	1996 **to** 2005		
Dwt	**Low**	**Base**	**High**
5,000 to 20,000	1.25	1.5	1.75
20,000 to 50,000	1.25	1.5	1,75
50,000 to 100,000	0.25	0.5	0.75
100,000 to 200,000	0.25	0.5	0.75
200,000+	0.25	0.5	0.75

Figure 6.3: TANKER SURPLUS TONNAGE

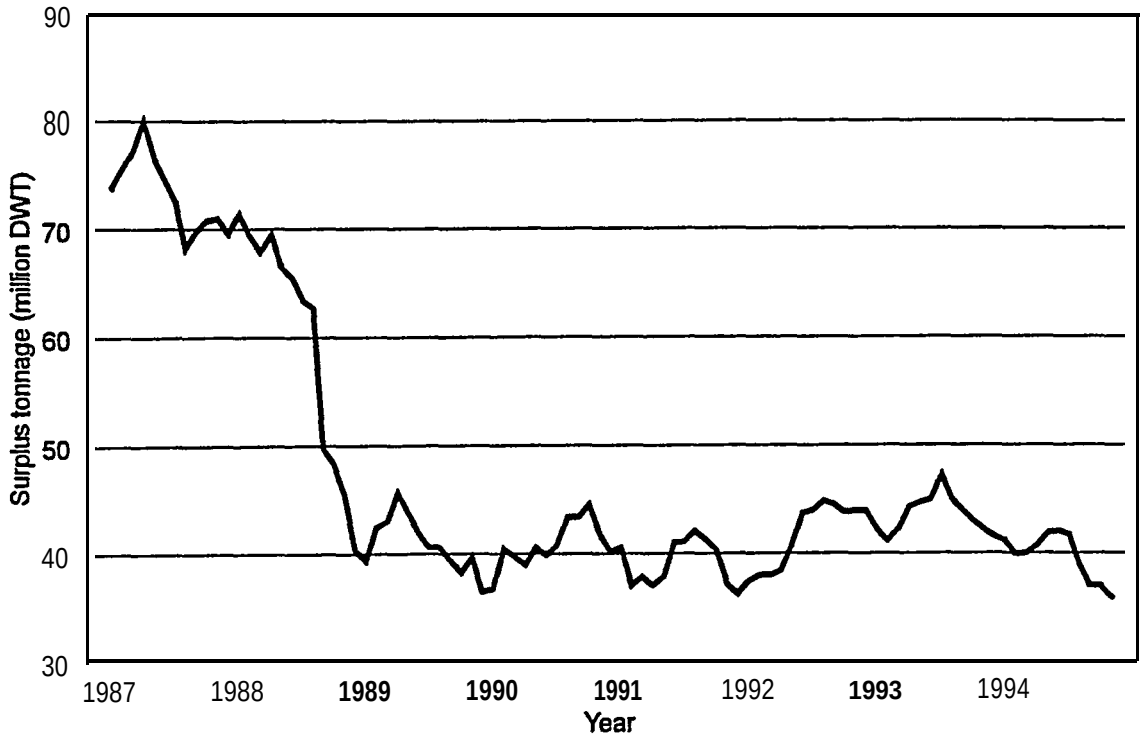
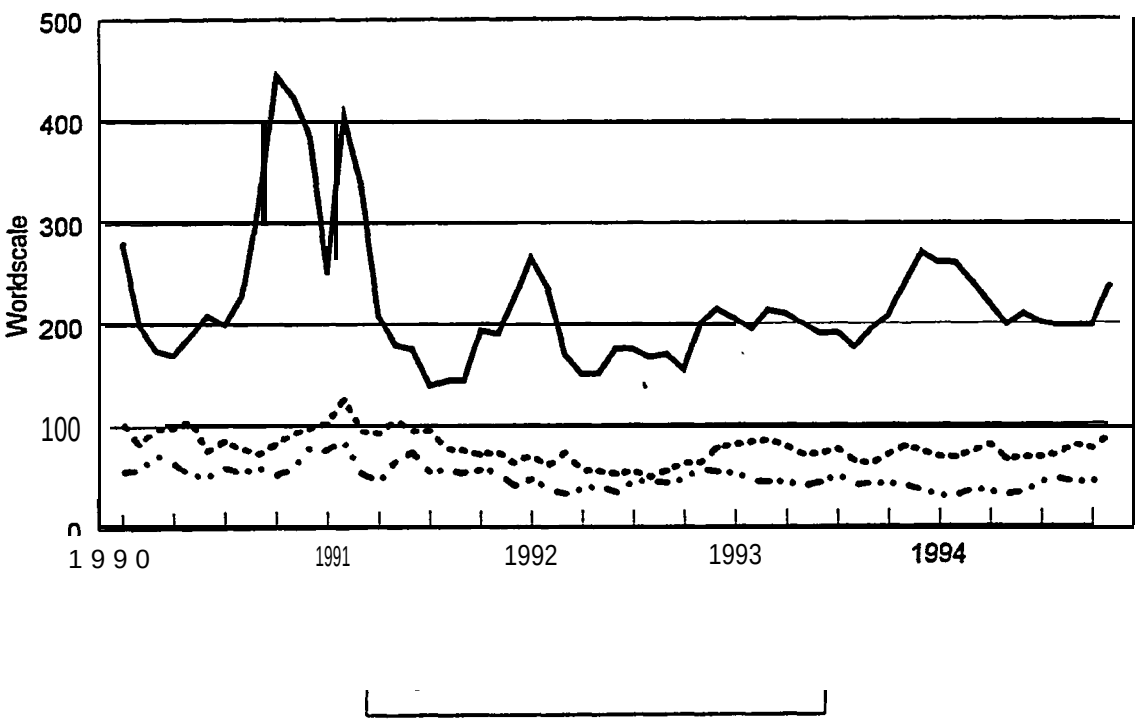


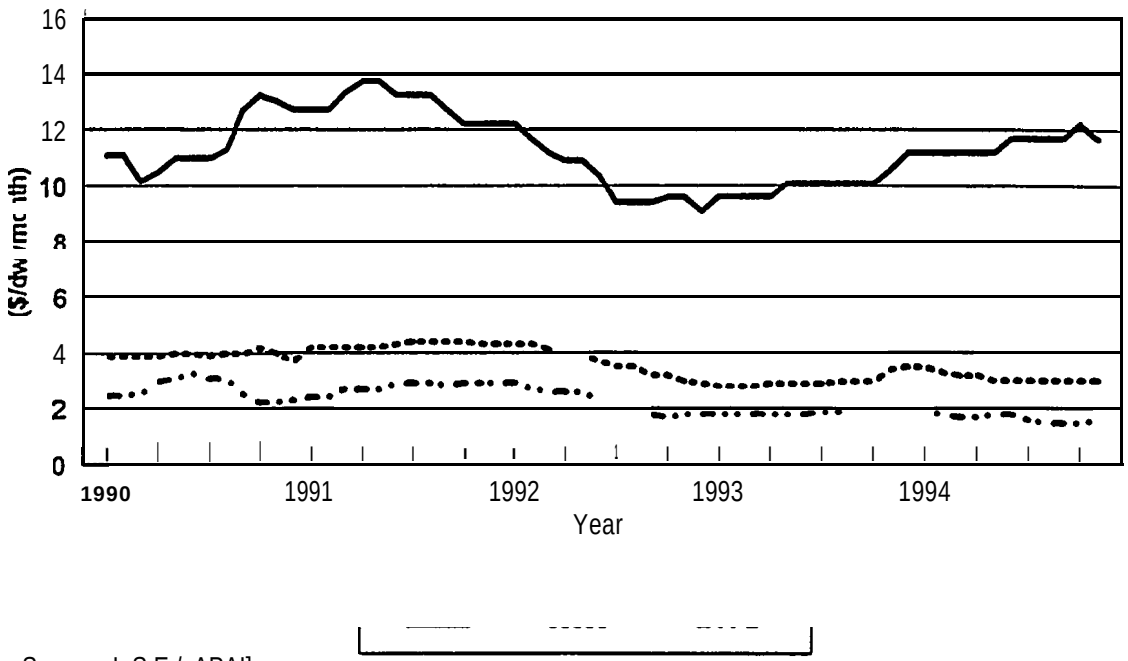
Figure 6.4: TANKERS - SPOT MARKET SCALE RATES



[Source: L.S.E./ APAll

Figure 6.5: PERIOD MARKET SCALE RATES

(1 year)



~Source: L.S.E./ APAI]

6.4.3 Chemical Tankers

TRADE FACTORS AND MARKET CONDITIONS

- This sector of the fleet is made up predominantly by chemical tankers, trading in organic and inorganic chemicals, but includes a small number of other specialist carriers such as fruit juice, edible oils or wine. In many cases, vessels are sufficiently flexible to carryall these cargo types, and the number of dedicated specialist carriers is small.

- The chemical tanker trades are strongly related to the economies of developed nations, reflected in the pattern of ownership of the fleet, as described earlier, with almost 70% of the fleet owned in Japan, North West Europe or the United States.

- Traditional trades are centered around Western Europe, US and Japan. There is growing importance in trades with non-OECD nations however, as industrialization increases. Of particular importance in this respect are China, Ta"Nvan and India.

- The chemical tanker trades also benefit from the trend in producer countries in refining crude oil, rather than shipping it. The associated products include petrochemicals and lub. oils, shipped in chemical tankers.

- The forecast improvement in OECD economic growth will have a positive effect on the chemical tanker trades, and no slowdown in growth is therefore expected.

- The recovery from the recession in the early 1990s, in particular in the US, has lead to an improvement in conditions and some firming of freight rates. The following table refers to average dollars per metric tonne for moving chemicals on the route Houston/Rotterdam **(Source: Clarkson Research).**

	Parcel Size	
	3,000 mt	**5,000 to 7,500 mt**
	(Average Dollars per metric tonne)	
1992	31.38	19.25
1993	27.31	19.10
1994 *	42.10	22.58

*** Average April to September**

Improvements have also been seen in the time charter market, as follows (Source: Clarkson Research)

Time Charter Market ($ per day)

	7,000 Dwt IMO 3 Coated	12,000 Dwt IMO 2/3 Coated	12,000 Dwt IMO 2 Stainless
Spring 1992	6,000	9,500	12,000
Spring 1993	5,800	7,500	10,500
Spring 1994	5,800	7,500	10,500
Autumn 1994	6,000	8,000	11,000

- No significant surplus has evolved in the chemical tanker fleet and growth in trade is therefore expected to translate fairly readily into demand for new tonnage.

FLEET DEVELOPMENT

- The chemical tanker fleet grew strongly through the 1980s and early 1990s, and the fleet has one of the youngest average ages at 12 years.

- As discussed in section 5 however, the rate of growth of the fleet has slowed, and this is more likely to be indicative of future growth rates, below the 4.77% seen in the 5 years up to the end of 1992.

- Having said this, expected economic developments will maintain moderate growth in the fleet for the foreseeable future. As the fleet profile matures however, the rate of increase will continue to slow and some turndown will therefore be expected in the second half of the forecast period.

FLEET GROWTH FORECASTS

- Taking the above into account, along with the expected OECD growth rate in GDP at around 3% per annum up to 2000, the following growth forecasts are made for the chemical tanker fleet:

1996 to 2000			2001 to 2005		
Low	**Base**	**High**	**Low**	**Base**	**High**
2%	**3%**	**4%**	**1.5%**	**2.5%**	**3.5%**

- **No distinction is made** between the size bands. The differential rates of growth outlined in section 5 of this study are judged to be local factors in the fleet development process.

6.4.4 Bulk **Carriers**

TRADE FACTORS

- The average rate of growth of volume of the major bulk trades in the period 1976 to 1992 was 3.1% per annum.

- As discussed earlier, the forecast published by the World Bank anticipated a slow-down in the rate of growth of bulk trades due to a number of primary changes in trading patterns, and the slowdown is expected to be greatest in the major bulk markets, shipped in panamax ships and above, with a less marked turndown in minor bulk trades. The assumed forecasts were as follows:

	Volume Changes, (average annual percentage)	
	1985 tO 1990	1990 to 2000
	Actual	**Projections**
Major Bulks	2.8	1.6
Minor Bulks	1.5	1.6

- The major bulk commodities are iron ore, coal, grain, bauxite/alumina and phosphate rock. There are numerous other more minor cargoes more or less specialized, including other ores, agricultural products, salt, kaolin, rape seed, tapioca, steel products, etc, etc.

- The relative volumes of these cargoes in 1992 and 1993 were as follows (Source: Fearnleys).

Major Bulks, Total Seaborne Trade

	Million Tonnes		
	1992	**1993**	**'A Change**
Coal	**370.9**	**366.7**	-1.1
Grain	208.3 '	193.7	-7
Iron Ore	333.9	353.8	+6
Bauxite/Alumina	47.6	50.7	+6.5
Phosphate Rock	29.1	26.7	-8

- whilst changes in trading patterns are anticipated, the extent of changes are anticipated to be less than will be seen in the oil trades. It is possible that the extent of the slowdown envisaged by the World Bank projected figure shown above might be overly pessimistic. Certainly, both the SAJ and AWES assumed significantly higher growth in bulk trade values, as follows:

	Average Annual Growth Rate 1995 to 2000	
	SAJ	**AWES**
Major Bulks	1.81%	1.02%
Minor Bulks	2.52%	2.31%

The projection for major bulks is in line with the World Bank projection, but for minor bulks the forecast level is higher. This is consistent with the recovery in economic performance, the shift towards processed goods and the decreasing importance of major commodities in the global economy.

- The prospects for bulk cargo movements are normally linked to the principal "ship-demanding" industries, that is steam coal (power generation), steel and iron (requiring both coking coal and iron ore) and agriculture.

- Since the start of the 1990s despite being price competitive, the consumption of coal has been falling, due to increasing regulatory controls over exhaust gases, as indicated in the following table **(Source : BP Statistical Review of World Energy).**

Year	Consumption (Million Tonnes OEU)	'A Change
1983	1,925	
1984	2,002	**+4.03**
1985	2,082	**+3.97**
1986	2,123	**+1.97**
1987	2,186	**+3**
1988	2,226	**+1.8**
1989	2,244	**+0.64**
1990	2,229	**-0.68**
1991	2,162	**-2.99**
1992	2,153	**-0.42**
1993	2,141	**-0.57**
1994*	2,150	**0.42**

.Japanese Maritime Research institute estimate

The increase forecast for 1994 and 1995 reflects the upturn in the world economy, but it is likely that only a slow growth will be seen as economies continue to recover, as alternative energy sources are utilized, in particular LNG.

- The output of crude steel is strongly linked to manufacturing output and thereby the performance of the economy. The following 'table charts how this has changed over the last decade. **(Source: Institute of Shipping Logistics).**

Year	output Million Tonnes	'A Change "
1983	683.5	+6
1984	710.1	+3.9
1985	718.9	+1.2
1986	713.5	-0.7
1987	738.5	+3.5
1988	780.1	+5.6
1989	786.0	+0.8
1990	770.5	-2.0
1991	736.5	-4.4
1992	721.2	-2.1
1993	730	+1.2
1994	723.3	-0.9

In the medium to longer term, the production of steel is anticipated to improve along with improving economics, although growth is likely to be fairly slow.

In addition, the pattern of steel production is also likely to continue to change, with a gradual movement of production away from traditional steel producing countries (Japan/US/EU) towards emerging steel-making nations, and in particular South Korea, Taiwan and Brazil.

Demand for agricultural shipments is both seasonal and subject to wide fluctuations, depending on the vagaries of climate. in this respect, the movement of grain has the greatest influence on the spot market, in particular in the panamax sector, in which the majority of grain cargoes are carried.

Grain consumption fluctuates although on a generally increasing trend, as follows. **(Source: ISL)**

Year	Grain Consumption Million Tonnes	'A Change
1985	181.5	
1986	165.3	-8.93
1987	185.9	+12.51
1988	196.4	+5.62
1989	192.2	-2.15
1990	191.5	-0.34
1991	200.2	+4.52

- In the medium to longer term, this upward increase is likely to continue, in line with increasing population size and improving diets of those in developing countries, in particular in Asia.

FLEET DEVELOPMENT

- The bulk carrier fleet is in the mature phase of development, growing at a rate of about 19f0 per annum.

- As with tankers, scrapping has picked up in the bulk fleets in recent years, although to a much less marked extent, as follows:

	Bulk Carriers Broken up or Lost (million dwt)
1987	9.6
1988	1.9
1989	0.8
1990	1.7
1991	2.7
1992	3.7
1993	4.4
1994	4.6

- The high age profile of the fleet is likely to demand a higher scrapping rate than currently being experienced, but the fleet is being buoyed up by increases in freight rates, as discussed below.

  There is currently concern that with increasing order books, fleet balance and freight rates will be adversely affected.

MARKET CONDITIONS

Surplus tonnage in the bulk carrier fleet never reached the heights attained by the tanker fleet in the early 1980s, although it was still the subject of some speculative over-ordering, with lay-ups peaking at around 10 million dwt in 1983.

The total laid up tonnage reduced to 5 million dwt by January 1995, around 2% of the fleet. The total surplus tonnage, including slow steaming and other idle tonnage, is 22.4 million dwt, or around 10% of the fleet.

Figure 6.6 shows the trend in surplus tonnage since 1990. Surpluses have reduced slightly over 1993 and 1994, in response to improved market conditions.

The spread of surplus tonnage across the size bands is reasonably even, as follows:

Size **Band (thousand Dwt)**	**Surplus Tonnage (million Dwt)**	**% of Total Fleet**
10to40	**5.9**	**7.1%**
40 to 80	**5.8**	**7.2%**
8 0	**7.2**	**11.3%**

Ships of panamax size and above are showing the greatest level of surplus and with an overall level of surplus of around 10% some attrition may be required in the fleet to improve the market balance.

Freight rates have been performing well in the dry bulk sector. Figure 6.7 shows the development of the overall Baltic freight index in recent years, and Figures 6.8 and 6.9 the performance of voyage and time charter rates for various size bands.

The Baltic freight rate has reached record highs, and all sectors are performing well. The Cape size sector has performed best in the recent period, but has also been the most volatile, showing wide fluctuations, in particular in the time charter market.

FLEET GROWTH FORECASTS

- Based on the above, it is expected that the rate of growth of the larger sectors of the fleet will slow down. If this does not happen, then over-capacity will increase appreciably.

- Handysize ships are expected to continue to decline in popularity in favor of handymax ships, and handymax are expected to continue to grow in line with improvements in economic performance.

- The following forecast assumptions have been made for fleet growth.

	1996 tO 2005		
Dwt	**Low**	**Base**	**High**
5,000 to 20,000	0	0.25%	0.5%
20,000 to 50,000	0.5%	0.75%	1%
50,000 to 90,000	0.25%	0.5%	0.75%
90,000 to 200,000	0.25%	0.5%	o.75%
200,000+	0.25%	0.5%	0.75%

Figure 6.6: BULKER SURPLUS TONNAGE

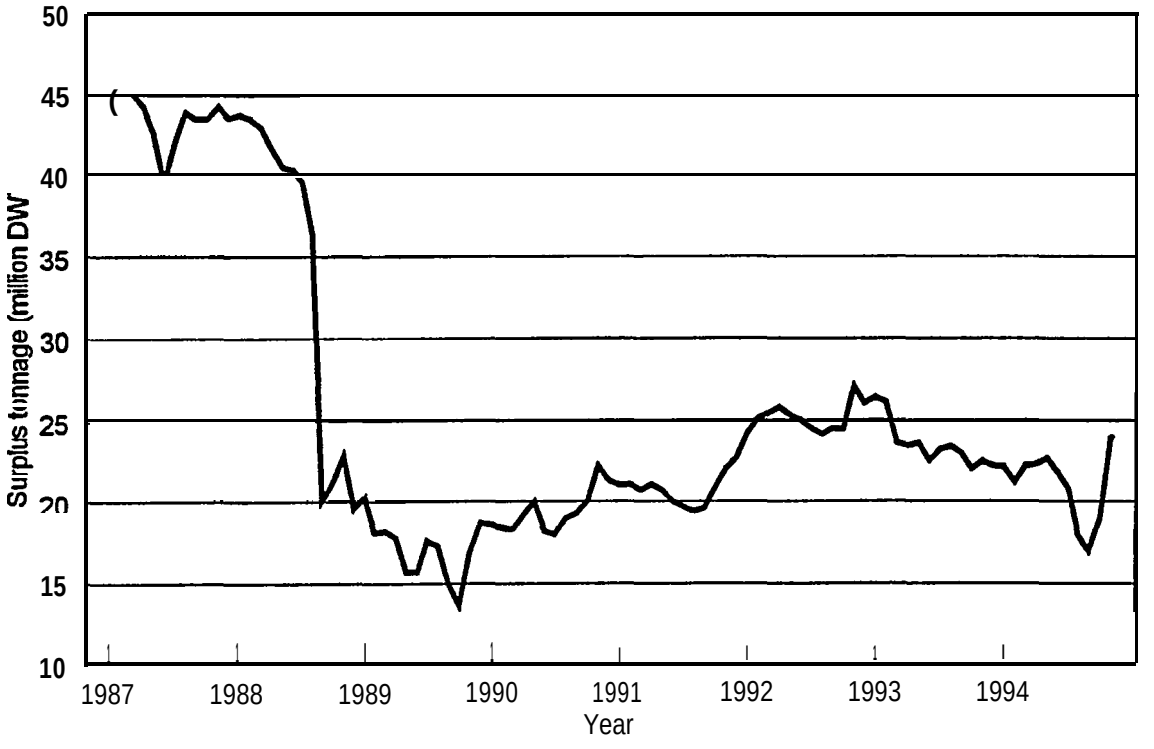
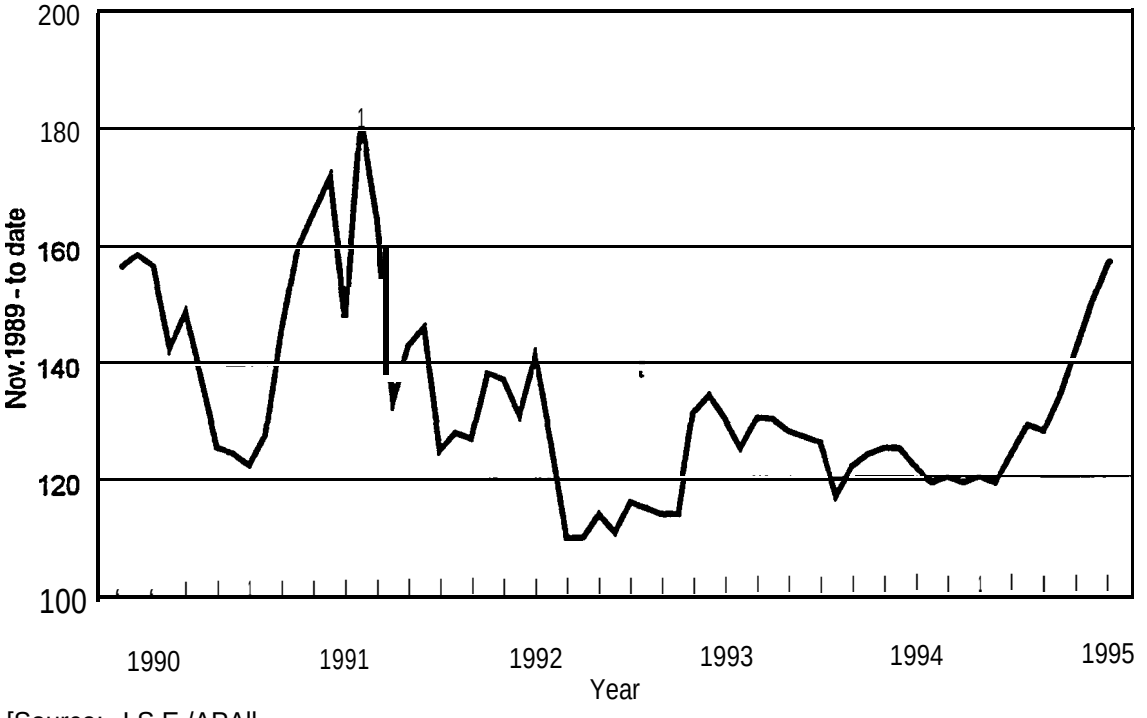
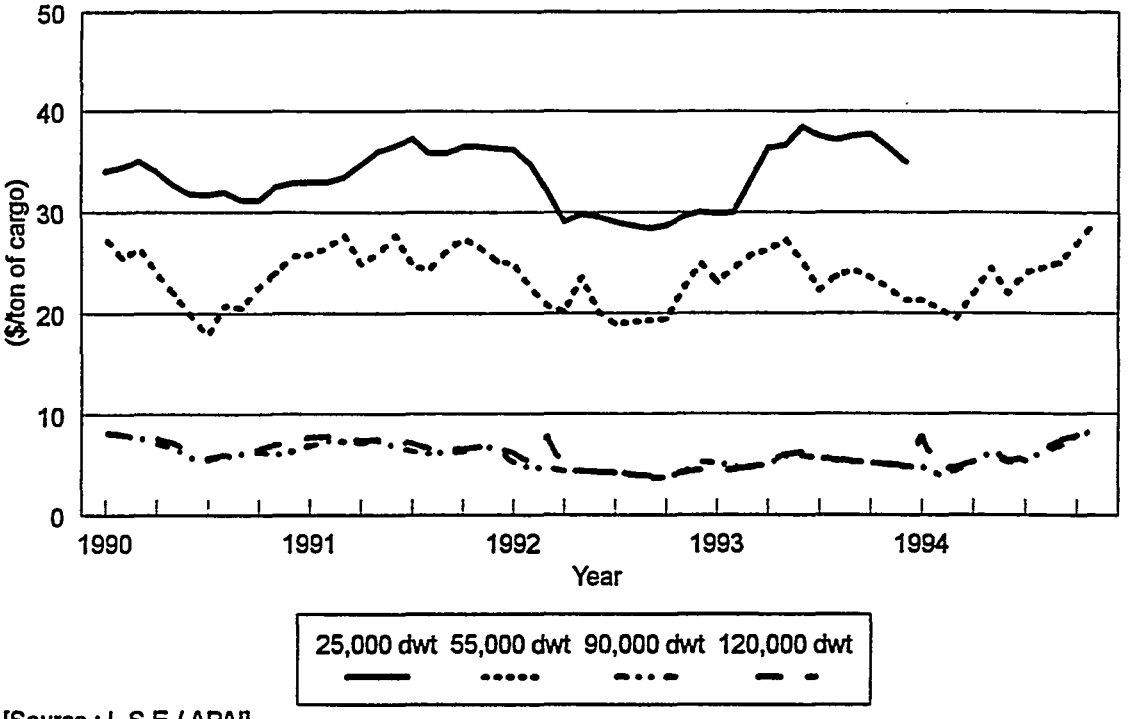


Figure 6.7: BALTIC FREIGHT INDEX



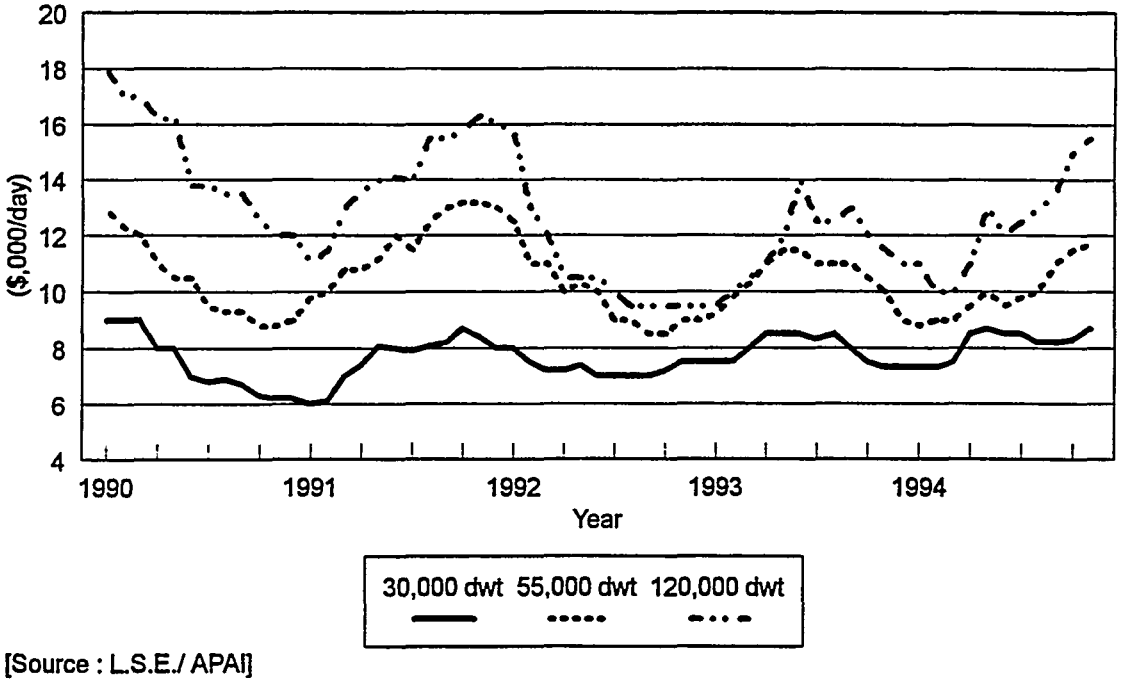
[Source: LS.E./APAll

Figure 6.8 : BULKER - VOYAGE RATES



[Source : L.S.E./ APAI]

Figure 6.9 : BULKER - TIME CHARTER (1 year)



[Source : L.S.E./ APAI]

6.4.5 Combination Carriers

TRADE FACTORS

- Combination Carriers (OBOS) are generally large ships, trading in the oil and dry bulk sectors, and the trade factors are therefore in the main those listed in the preceding chapters.

- Generally, the proportion of ships active in each fleet sector is biased towards dry bulks, although this fluctuates with demand.

- At the end of 1994, the proportion was 66% active in dry bulks and 34% in oil trades. The proportion active in the dry sector increased marginally over the year, in reaction to increasing freight rates.

FLEET DEVELOPMENT

- The OBO fleet is in decline. Very few ships have been built over the last decade, and very few are currently on order.

- The OBO fleet developed strongly in the mid to late 1970s, as an attempt at flexibility to maximize the potential charter rate, depending on market conditions. However, OBOS became unpopular due to both safety problems and the fact that charterers perceived that the ship type was less than efficient in both cargo sectors (wet and dry bulks). As a result, the fleet declined in the first half of the 1980s, and following a more stable period in the second half of that decade, the decline has continued in the first half of the 1990s.

- There have been some improvements in design and a slight upturn in newbuildings recently. However, whether the OBO concept will return to vogue is uncertain. The move towards shipment of products, rather than crude, may increase the demise of the type.

- The rate of combination carriers proceeding to scrapyards is increasing, as demonstrated by the following statistics:

	Combination Carriers Broken up or Lost (million Dwt)
1987	1.1
1988	0.4
1989	0.2
1990	0.4
1991	0.3
1992	1.0
1993	1.9
1994	2.7

- The combined carrier fleet is small and it should be noted that 2.7 million dwt represents around 10% of the fleet. This may lead to the marked downturn in this fleet sector over the past year.

MARKET CONDITIONS

- Freight conditions are the same as those for oil and dry bulks, as described in the previous sections.

- For older ships, the ability to operate in the wet sector is limited, but modem designs that achieve better efficiency in either sector are attracting something of a premium. This is due to the ability to switch between market sectors to obtain the optimum freight rate.

- One analyst, Clarkson Research, estimates that good modem tonnage , has earned a premium of $4,000 to $5,000 per day. Some owners remain committed to the concept, and for these reasons the OBO fleet is expected to be replaced by new tonnage, although no expansion is anticipated.

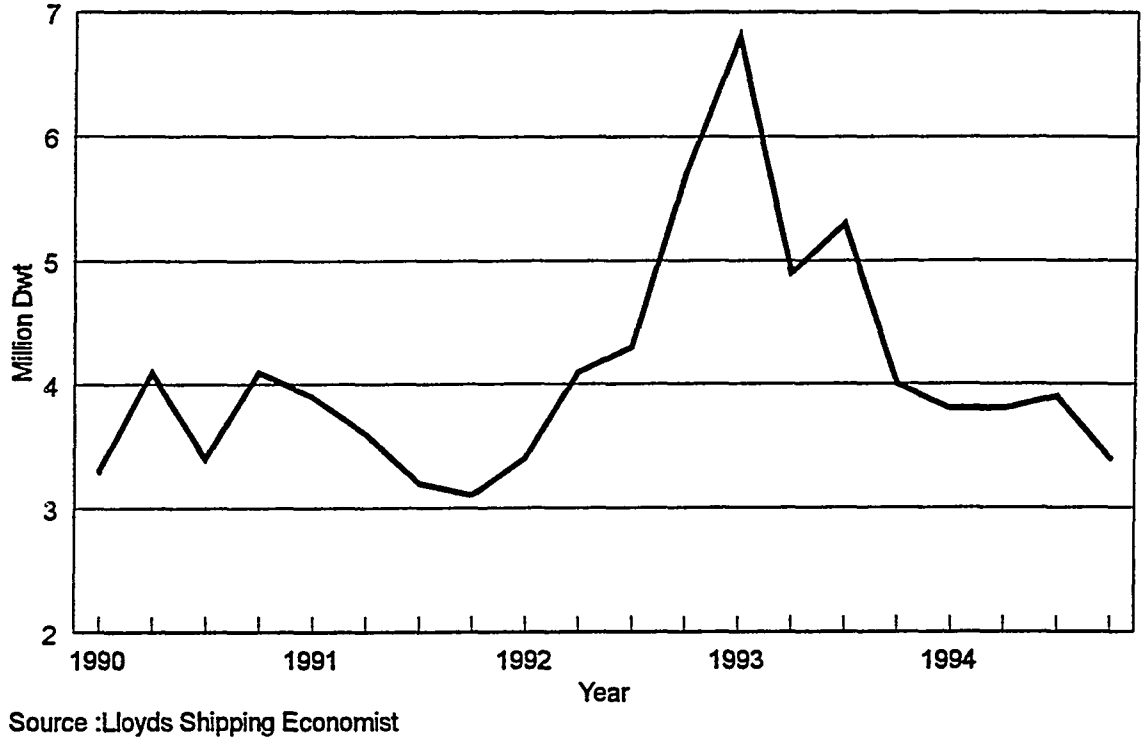
- Figure 6.10 shows how the level of surplus tonnage in the OBO fleet has changed over the past two years. Current surplus tonnage is estimated to be 3.1 million tonnes, or 12% of the fleet.

FLEET GROWTH FORECASTS

- No growth in the OBO fleet is anticipated at this time, although this situation should be watched closely.

- The fleet development curve for OBOS shows the characteristics of 'fashion'. It is conceivable that improved earnings in the modem fleet will lead to a re-surgence of this sector in the future, although at this time there is no indication that this is happening, and suspicion of many owners and charterers remains.

Figure 6.10 : OBO TOTAL SURPLUS



Source :Lloyds Shipping Economist

6.4.6 General Cargo

TRADE FACTORS

- In overall terms, the volume of general cargo being shipped is increasing, for the reasons outlined at the start of this chapter. The estimate given in the World Bank study paper presented in Table 6.2 of this report were for an increase to 5.5% growth in volume per annum, in response to improved economic performance.

- Despite this, the major trend is for a decline in the volume carried conventionally, and an increase in the level of containerization. The following table presents the percentage of general cargo that is containerized in key ports around the world:

'A **of General Cargo Containerized**

Port	**1985**	**1990**	**1992**
Singapore	64.6	81.2	86.7
Pusan		87.9	91.0
Rotterdam	49.6	51.4	52.7
Hong Kong	32.0	37.4	
Yokohama	30.1	38.2	42.4
Hamburg	50.9	67.6	74.6
Antwerp	29.0	38.0	43.4
Oakland	93.2	96.5	
Port Kelang	49.8	63.5	70.6
Bremen	47.1	58.7	63.6
Average	49.6	62.0	65.6

Source: Institute of Shipping Logistics

- These statistics indicate that the rate of increase in the level of containerization has been falling. The average annual rates in the periods shown was as follows:

1985 to 1990 : 4.56% per annum
1990 to 1992 : 2.86% per annum

- In addition to indicating the level of containerization of general cargoes, it should be noted that these figures also indicate the percentage reduction in cargo available for general cargo carriers, and highlight the trend that is leading to the decline of the fleet.

- It is anticipated that this rate will continue to slow as the limit of containerization is reached. Fully cellular ships will continue to make in-roads into the shipping markets of developing countries (one of the limits of containerization at this time), but demand for general cargo ships, and multi-purpose ships with a good TEU: DWT ratio in particular, remains reasonably strong.

- In trade terms, it is likely to be a misconception that the general cargo fleet is obsolete (see later statistics on utilization). However, it is true to say that the traditional tween-decker is obsolete, and the question remains as to how this important sector will be replaced.

- The utilization of multi-purpose ships in the sector around 14,000 dwt to 25,000 dwt is good, although no standards within this range have yet emerged. In addition, the development of intra-regional trade is also likely to stimulate the growth of small coastal tonnage in this sector.

FLEET DEVELOPMENT

- Decline in the fleet (currently at an annual average rate of 2.1%), is likely to continue. This is due not only to the continuing level of containerization, but also due to increasing efficiency of new multi-purpose vessels.

- The following table charts the build-up of general cargo tonnage broken up. **(Source, ISL).**

General Cargo Ships Broken Up

	Number	Million Dwt
1985	**1,046**	**7.4**
1986	**888**	**6.6**
1987	**698**	**4.6**
1988	**564**	**3.5**
1989	**342**	1.6
1990	**351**	**1.9**
1991	* **284**	**1.8**
1992	**322**	**2.5**
1993	**290**	**2.2**

It can be seen from this table that scrapping has reduced from the very high levels seen in the mid 1980s, but is now rising again, as the fleet ages.

MARKET CONDITIONS

- The level of surplus tonnage of conventional general cargo carriers (see figure 6.1 1) has reduced to a small extent over the past two years, although fluctuating quite widely. The level at the end of 1994 was 2.2 million dwt, or around 3.5% of the fleet.

- This is surprisingly low, reflecting a good level of demand for the existing fleet. Figure 6.12 shows the split of surplus by size band. The percentage of the" fleet surplus by size is as follows:

Dwt	Surplus %
5,000 to 10,000	3%
10,000 to 15,000	3.7%
15,000+	4.1%

This shows no great variation by size of ship.

- This low level of surplus, coupled with improving conditions generally in shipping, has lead to a general improvement in freight rates, as shown in Figure 6.13.

- In summary, market conditions in this sector are reasonably good, although it has to be said that freight rates remain insufficient to cover the cost of building new tonnage in this sector.

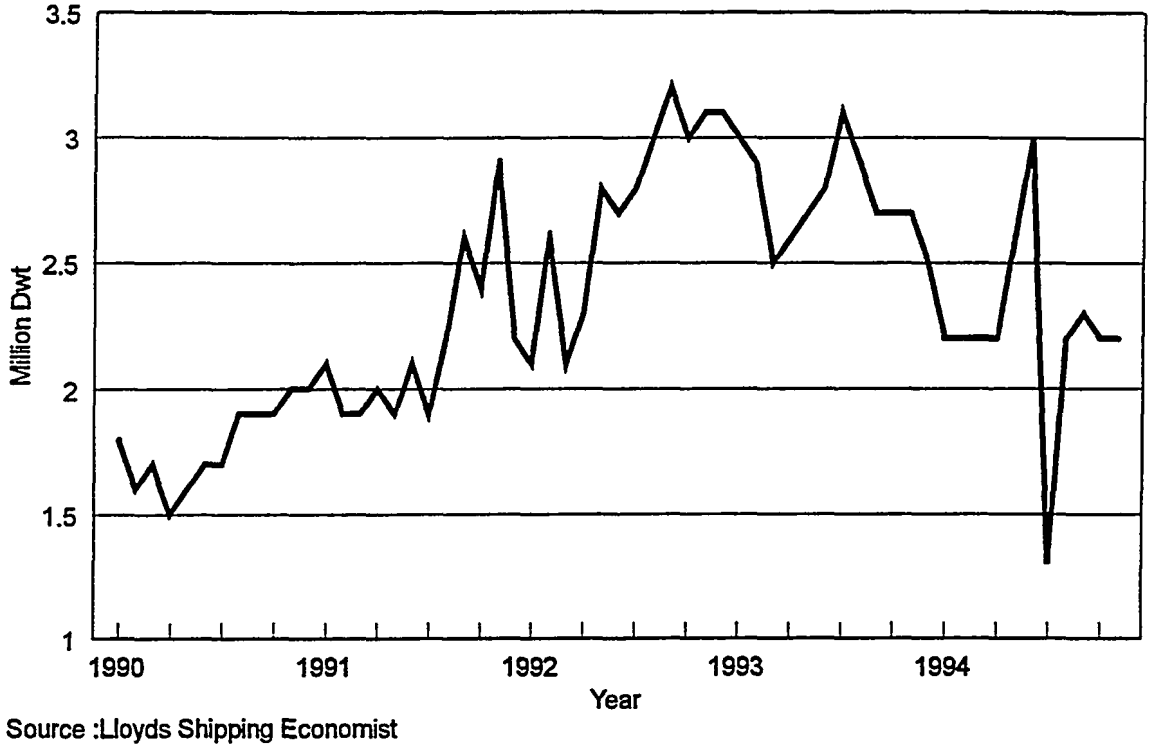
FLEET GROWTH FORECASTS

- It is anticipated that further decline will be seen in the general cargo fleet, due to increasing containerization, and the obsolescence of older tonnage.

- However, a limit to the level of attrition is likely to be reached (this is still a well utilized ship type), with the replacement of existing obsolete ships by modem multi-purpose tonnage.

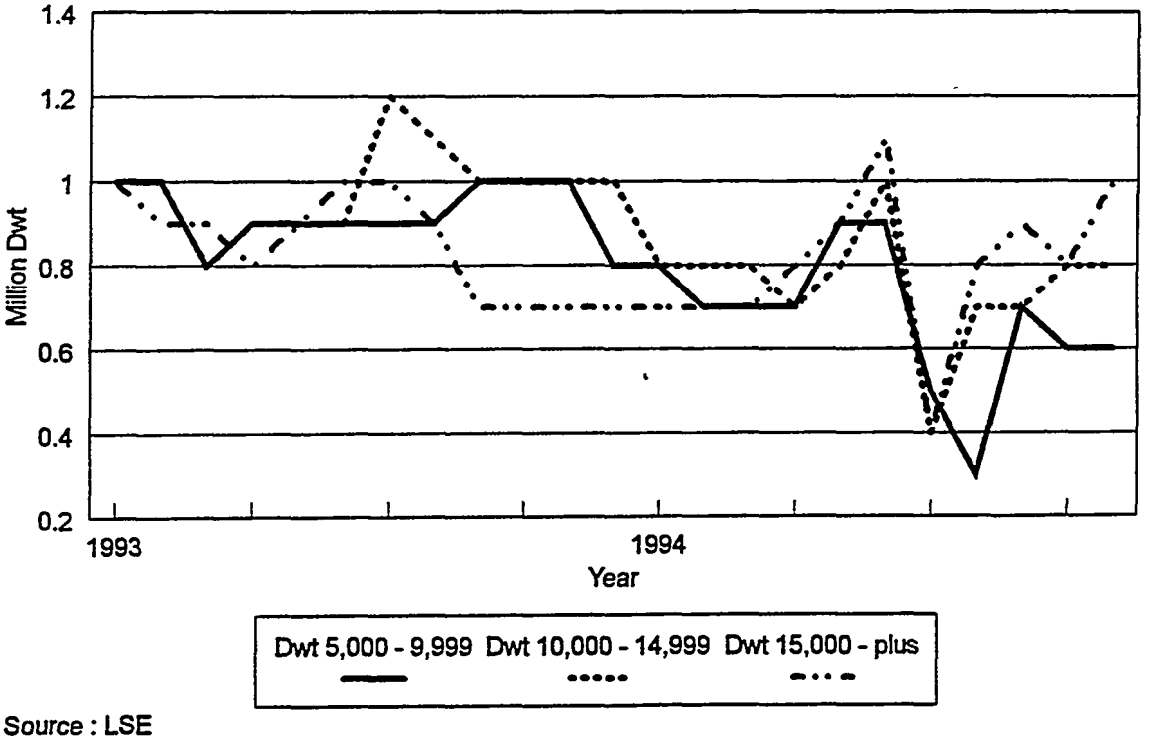
- Improving freight rates and utilization, coupled with a strong forecast for general cargo tonnage, suggest that the rate may slow down in the near future. It is therefore anticipated that the rate of decline will fall to 1.5% per annum over the first half of the forecast period, with the fleet achieving a balance thereafter. This leads to an anticipated rate of growth of -1.5% in the period 1996 to 2000, and zero thereafter.

Figure 6.11 : GENERAL CARGO TOTAL SURPLUS



Source :Lloyds Shipping Economist

Figure 6.12 : GENERAL CARGO SURPLUS



Source : LSE

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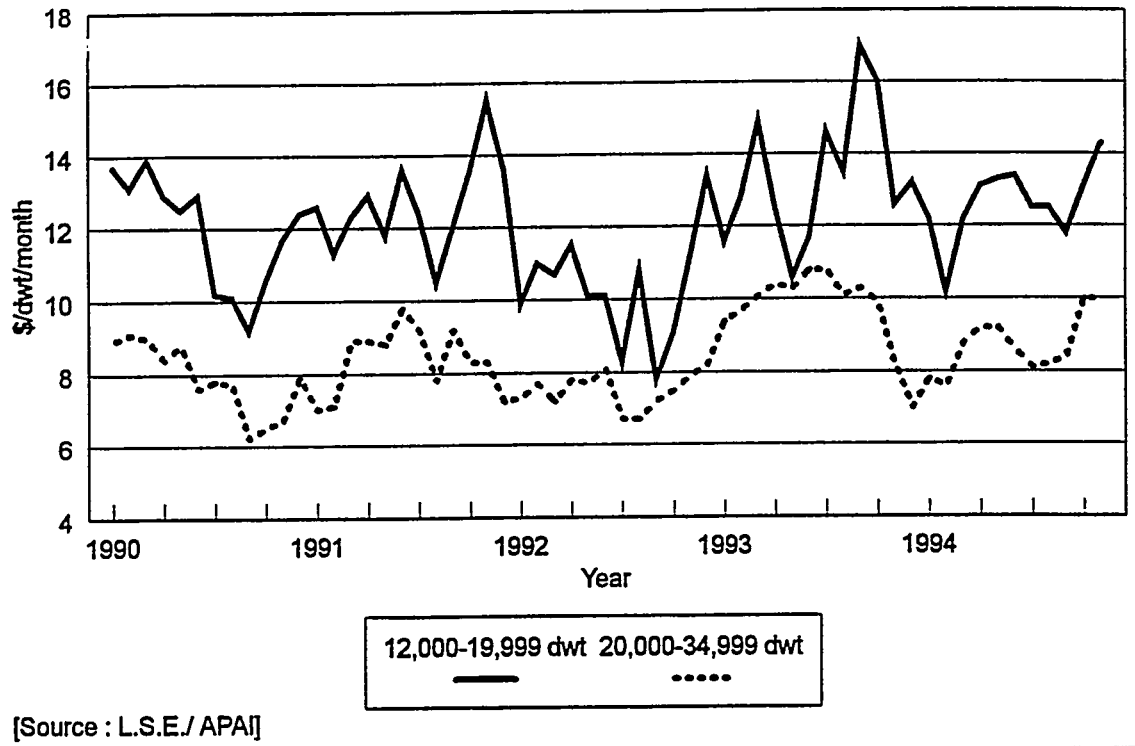
Figure 6.13 : GENERAL CARGO - TRAMP CHARTER



[Source : L.S.E./ APAI]

6.4.7 Container Ships

TRADE FACTORS

- As described in the previous section, containerization has been gathering pace in the increasing market for general cargo. The rates of growth have been very high, as indicated in the following table:

	Total Containers Handled (thousand TEU)	Percentage Growth
1975	17,410	16.4*
1980	37,163	8.5*
1985	55,903	8.9
1986	60,877	10.5
1987	67,257	9.7
1988	73,810	8.1
1989	79,816	5.5
1990	84,224	11.2
1991	93,846	7.6
1992	100,734	8.7
1993	109,500	9.1
1994	119,500	9.0

* **Average Annual Rate 1975 to 1980 and 1980 to 1985**

Source: Containerization International Yearbook, 1994 estimate by JAMRI

- Containerization was first developed in the 1960s and this is the most modem sector of the fleet. It can be seen from the above statistics that very high growth was seen in the establishment phase 1975 to 1980, but with high growth rates since that time. The amount of traffic increased nearly seven-fold in the period 1975 to 1994, and at this time the trade shows no signs of slowing down.

- As the volume of traffic has increased, so the pattern of trade has developed, with the establishment of liner routes and conferences and the pattern of feeder trades and hub ports such as Hong Kong, Singapore and Rotterdam.

- As this pattern becomes more firmly established, there is a trend towards ever larger ships on the long distance routes, to gain economies of scale and improved frequency of service. Designs up to 6,000 TEU are now being produced, although no ships of this size have yet been constructed.

- As with the fleet, the trade itself is still in the development phase, showing high levels of growth. This will inevitably slow down at some point, as the mature pattern of trade develops, and the growth in general cargo trade will become more representative of the growth in container volume.

FLEET DEVELOPMENT

- The container fleet is still in the development phase, showing high growth levels, as described in section 5 of this study. This is characterized by high growth rates, and low age profile, in particular in the larger sectors of the fleet. Vessels above 40,000 dwt show a significantly lower age profile than smaller ships.

- The estimated average growth rates by ship size, repeated from section 5 are as follows:

Dwt	Annual Growth Rate
5,000-10,000	**3.8%**
10,000-20,000	**4.7'%**
20,000-30,000	**4.7%**
30,000-40,000	**3.1%**
40,000-50,000	**7.9%**
50,000+	**10%**

- The most important element of forecast in the fleet development is when will the profile move from the development phase to the more mature phase. The indications of this transition would be:

  - growing fleet surplus
  - falling freight rates
  - falling order books
  - falling prices.

  At this time, none of these indicators are present and strong growth is continuing. However, for all builders operating in this sector, the monitoring of these parameters is of vital importance. The turning point is very hard to predict, but many analysts see it happening sooner rather than later. This is anticipated in the forecast presented in this study.

- The turning points in life cycles are of. great strategic importance. The implications of this change for shipbuilders trying to enter this market sector would be that market share would have to be gained at the expense of established builders rather than through market growth and competitive conditions will become more difficult.

- In terms of scrapping, little has been seen in this sector up to date, as follows:

	Number of Ships Scrapped	Thousand Dwt
1985	25	324
1986	32	541
1987	23	369
1988	.8	52
1989	9	121
1990	4	37
1991	2	28
1992	8	98
1993	9	153

(Source: ISL)

Even at the peak in the heavy scrapping period in the mid 1980s, the scrapping of container ships represented only 1.5'% of the total tonnage scrapped.

- This situation is likely to change over the forecast period, as the number of vessels reaching 25 years increases. Up to this point, only the earliest ships from early development phases have reached the scrapyard.

MARKET CONDITIONS

- Figure 6.14 shows how the surplus in the container fleet has moved.

- There is little indication of surplus capacity at this time, and for much of 1994 the fleet was in balance, with zero excess of capacity over demand. This is an unusual situation, and some excess of capacity over demand is generally regarded as required for economic stability.

- To put Figure 6.14 into perspective, the peak of 400,000 dwt surplus in 1993 represents only around three quarters of one percent of the fleet, and there is clearly a long way to go to build up a surplus.

- The warning signs must be watched closely however. Building has been gathering momentum and there is always a danger that excess could build up quickly.

- There are already some warning signs, with some routes reporting over-capacity. Due to the liner nature of trades it is difficult for owners to maintain flexibility in switching routes. In addition, due to the nature of the way that surplus is repotted, it is excess tonnage that is revealed by the statistics and not excess slot capacity; this will show some lag.

- Newbuilding of container ships has seen a significant increase in capacity in recent years, but fortunately **Up** to this time this has been supported by the increase in freight volumes and freight rates have not yet suffered significantly, although the industry could be described as increasing in nervousness with regard to capacity.

- Figure 6.15 presents details of time charter rates for container ships and figure 6.16 the rates on major conference routes. In general, rates have been fairly stable since 1992, although with some falls from the period before that. Latest reports indicate that rates are now rising, rather than falling.

FLEET GROWTH FORECAST

- The container ship fleet is forecast to make the transition from the growth phase to the mature phase over the forecast period. This will result in lower growth rates in the second half of the period.

- The average size will continue to grow (the 6,000 TEU ship is getting ever closer), and larger size bands will expand faster than the smaller sizes.

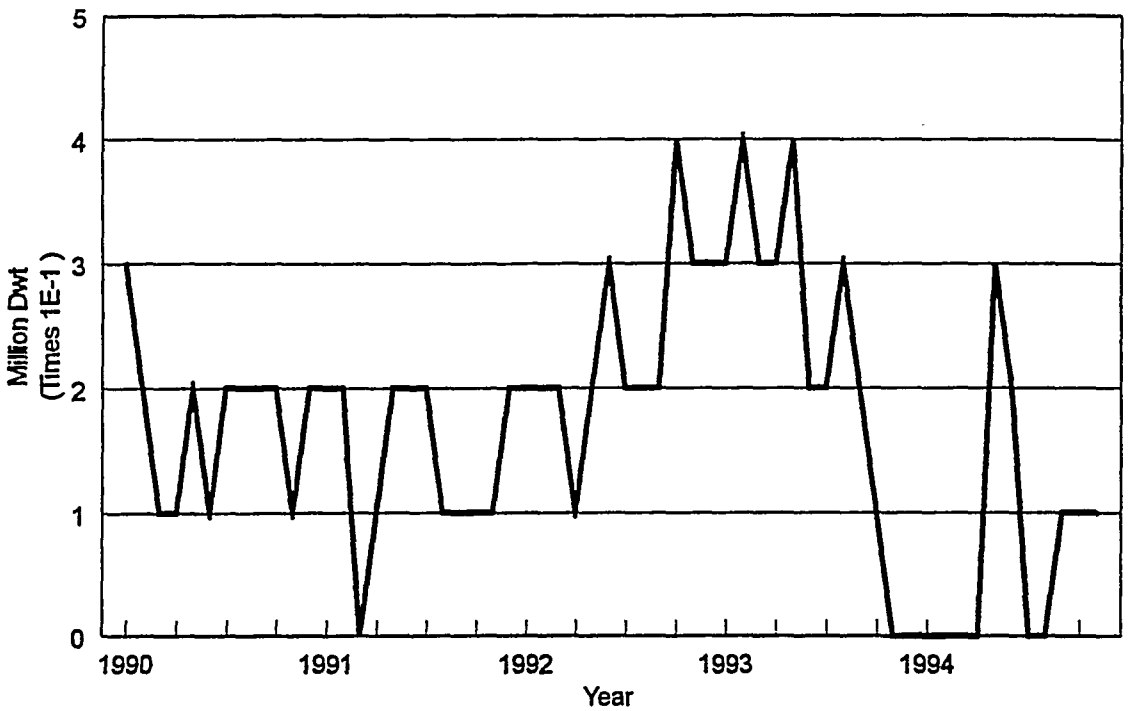
- The danger of over-capacity must be consistently monitored. This forecast concerns demand. The capacity for owners to build vastly in excess of demand was amply demonstrated by the tanker building boom in the 1970s, and there is a danger that this behavior could be repeated in the container sector.

- The rates of growth assumed in the forecast model areas follows:

	1996 to 2000			2001 to 2005		
Dwt Range	**Low**	**Base**	**High**	**Low**	**Base**	**High**
5,000 to 10,000	**2.5%**	**3%**	**3.5%**	**1.5%**	**2%**	**2.5%**
10,000 to 20,000	**3.5%**	**4%**	**4.5%**	**2%**	**2.5%**	**3%**
20,000 to 30,000	**3.5%**	**4%**	**4.5%**	**2%**	**2.5%**	**3%.**
30,000 to 40,000	**2.5%**	**3%**	**3.5%**	**1.5%**	**2%**	**2.5%**
40,000 to 50,000	**7%**	**7.5%**	**8%**	**4%**	**5%**	**6%**
50,000 +	**9%**	**10%**	**11%**	**4%**	**5%**	**6'%**

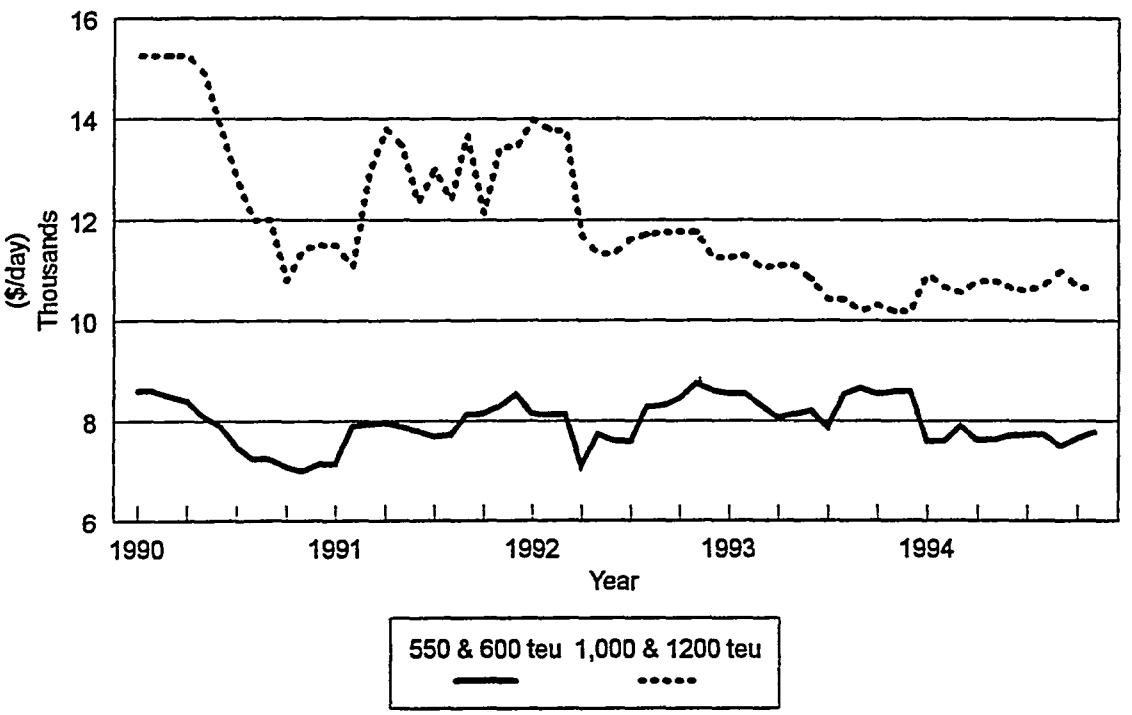
These rates allow for a slowing in fleet development as the mature phase is reached in the second half of the forecast period, and reflect the growing size of ships with higher growth rates in the larger size bands.

Figure 6.14 : CONTAINERSHIPS TOTAL SURPLUS



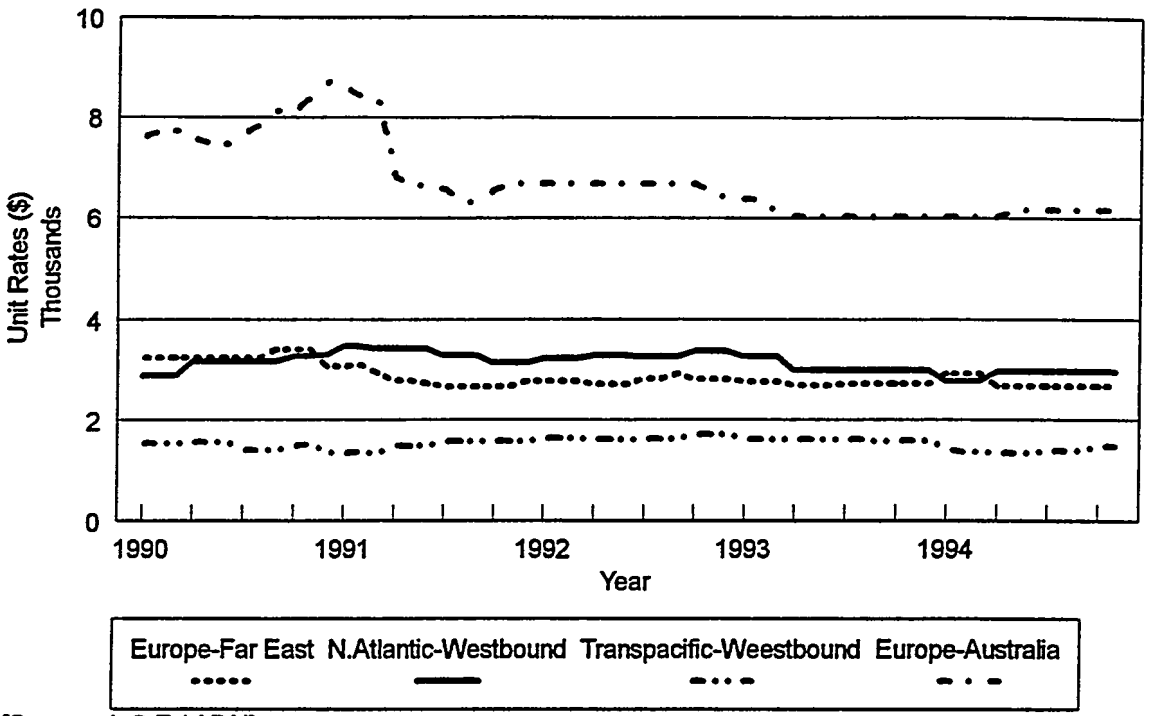
Source :Lloyds Shipping Economist

Figure 6.15 : CONTAINERSHIP CHARTER RATES



[Source : L.S.E./ APAI]

Figure 6.16 : MAJOR CONFERENCE RATES



[Source : L.S.E./ APAI]

6.4.8 Refrigerated Cargo Carriers

TRADE FACTORS

Ž This is a small highly specialized sector of the fleet. Refrigerated cargo ships are generally counted with general cargo ships by analysts, but there are a number of very specific factors that have to be taken into account.

- The reefer market is heavily influenced by the performance of the globai economy. Recession quickly brings a decline in the demand for high value luxury foodstuffs. The trade is also politically influenced, and as such is vulnerable to political decisions. The changes in trade with South Africa is a good example of this latter point.

Ž One of the most influential events in the reefer section in recent years has been the introduction of tariff quotas on bananas impeded into the. **EEC.** Bananas are a key reefer cargo, accounting for about 30% of trade. Banana imports fell by 20% in 1993 over 1992, and the industry was sent into panic, although the long term effect of these measures is likely to be negligible.

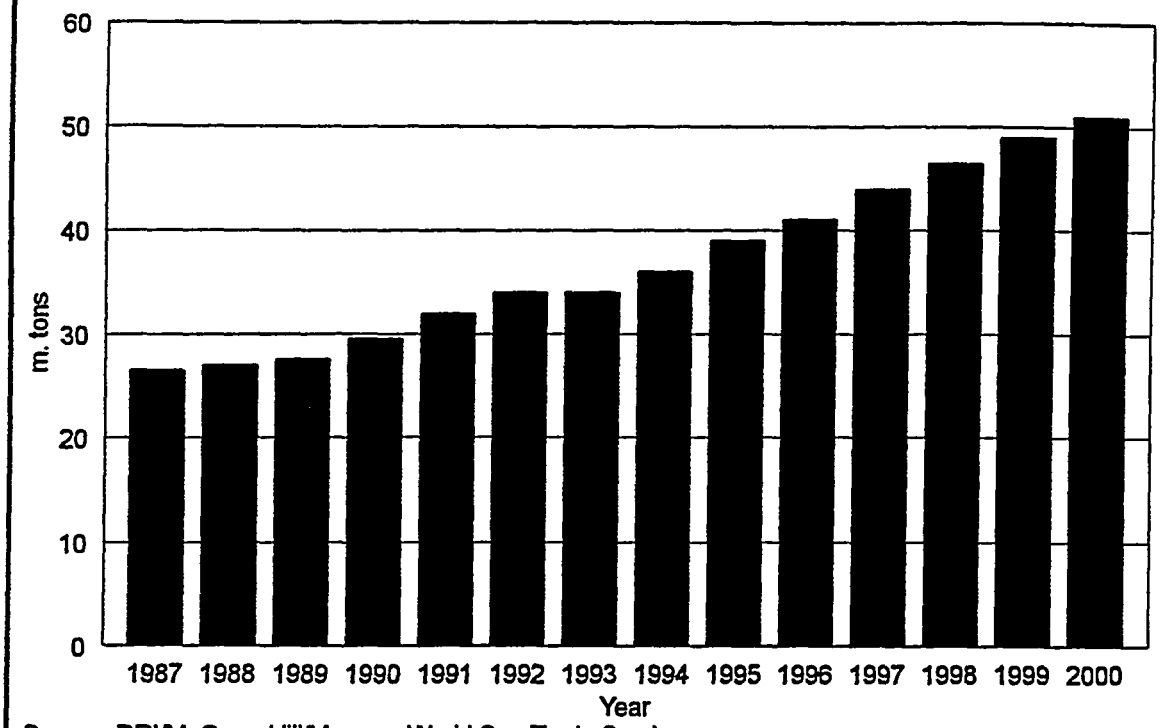
Ž Coupled with the economic recession, this lead to a lack of confidence in the reefer trades in 1993/1994 and a significant downturn in the order book.

Ž The anticipated improvement in the global economy, in particular in Europe and Japan, is expected to stimulate reefer demand and this will be further improved by improving living standards in developing countries. Other factors supporting recovery are the conclusion of the GAIT Agreement, the resolution of the EU banana dispute and general trade liberalization.

- Figure 6.17 shows how trade in reefer commodity volumes has developed since 1987, and with a forecast to 2000. It can be seen that growth leveled off in 1993 (following the EEC sanctions on bananas), but growth has continued thereafter and is expected to continue to do so. The estimated total volume of trade in 1994 was 36 million tonnes. The average annual rate of growth forecast in Figure 6.17 in the period 1996 to 2000 is 4.7%, very similar to forecasts for general cargo.

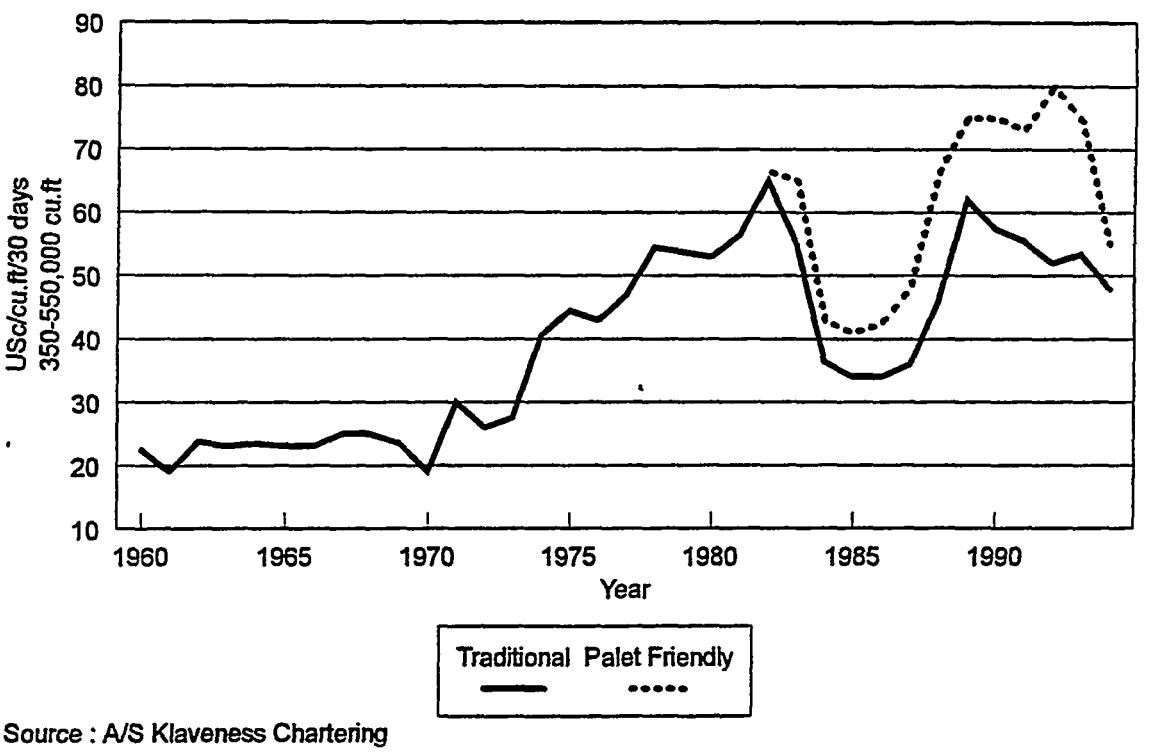
Ž Pattern of trade is expected to change to some extent, diluting the dominance of Europe and Japan as developing countries emerge. The Far East and in particular the Asian Tigers, will lead developments and Mercer Management Consulting (who undertook the forecast presented in Figure 6.17) estimated that the share of reefer imports in these countries will rise to almost 34% by **2000.**

Figure 6.17 : REEFER TRADE VOLUMES



Source: DRI/McGraw-Hill/Mercere World Sea Trade Service

Figure 6.18 : REEFER TIME CHARTER RATES



Source : A/S Klaveness Chartering

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FLEET DEVELOPMENT

Ž The slow down of fleet development has shown some signs of recovery, following a very significant downturn in ordering after the 1993 banana 'crisis'. The total number of reefers on order has developed as follows:

	Number of Ships on Order
Q1 94	63
Q2 94	**57**
Q3 94	**47**
Q4 94	**53**
Q1 95	**24**
Q2 95	**33**

- Coupled with an upturn in scrapping, with a total of 31 reefers (average age 24 years) scrapped in 1994, the fleet balance is improving.

Ž This is further being improved by the decline of the former Soviet fleet. As indicated in section 5 of this study, this accounts for over 16% of the total fleet and at one point it was anticipated that the liberalization of this tonnage would adversely affect the supply and demand balance. However, the very poor condition of this fleet has rendered the vast majority of ships as incapable of operating in the international market, with little use except for scrap.

- With the anticipated improvements in trade, the reefer fleet is expected to resume moderate growth.

MARKET CONDITIONS

Ž Following the recovery of the economy and optimistic forecasts for the future, along with the resolution of EU and GAIT trade difficulties, the reefer trades are much more confident than was the case a year ago.

Ž Figure 6.18 shows the downturn in freight rates that accompanied these problems, leading to the prevailing gloom in the industry.

Ž Since that time, conditions have improved. Klaveness report that the pallet friendly and traditional rates have converged at around 65 cents per cubic foot, showing an upward trend towards 70. This shows a rise of around 30% over the last year, as conditions have improved.

FLEET GROWTH FORECASTS

Ž Based on the improved prospects for reefer trades, the fleet is anticipated to resume moderate growth.

Ž The assumed rates of growth areas follows:

	1996 to 2005		
Dwt	Low	Base	**High**
5,000 to 10,000	**4%**	**4.5%**	**5%**
10,000 to 20,000	**4%**	**4.5%**	**5%**

6.4.9 LPG **Carriers**

TRADE FACTORS

- Liquid gas trades occupy very much a niche sector in the market, with LPG predominating over LNG in terms of ship numbers.

- The LPG trades are strongly linked to oil production, (in particular in OPEC countries), LPG being a product of the refinery industry. It is primarily a supply driven industry, and concerns over the future of the industry concentrate more on the development of sources of supply than demand.

- The shipment of LPG increased by an average of 4.5% per year in the period 1980 to 1992, although growth slowed appreciably in the recession years in the early 1990s. The development of the fleet has followed this closely.

Ž The pattern of trade is lead by export from OPEC nations and import to US/Europe and Japan, as follows **(Source: ISL).**

Major export areas (1992):

.Arabian Gulf	:	70.6%
.North Africa	:	17%
.Indonesia/Malaysia	:	9.3%
-Venezuela	:	3.1%

Major import areas:

.United States	:	19%
. Western Europe	:	21.7%
.Japan/South Korea	:	59.3%

It can be seen clearly from these statistics that export is dominated by Persian Gulf countries, and imports by Japan and South Korea.

- Interestingly, the supply of shipping tonnage (as described in section 5 of this study) is largely in the control of the importing nations, in Japan, North West Europe and the USA, together accounting for 60% of the fleet, although the USA is only a fairly minor player with 4.6%.

Ž New export and import areas are now developing. In the Gulf it appears that Saudi sources are peaking, whilst new sources come on stream from Abu Dhabi. Other developing sources of supply are found in Australia, West Africa and the North Sea and imports are developing in China, India and other growing economies.

- Growth in trade in the developed markets is anticipated to be only moderate. Significant increases are expected in developing markets however. Mobil anticipate that imports into China and India will increase by over 2 million tonnes per year by 2000.

- Domestic consumption, using road transport and pipelines are important factors in the LPG trades in addition to seaborne trade. in fact, at levels of demand of around 160 million tonnes in 1994, only 38 million tonnes were moved by sea **(Source: Gastech 94).**

Ž The prospects for increasing sea trade are good however. The general pattern of changes in trade favor seaborne growth, largely driven by imports from developing sources of supply. Thus, incremental growth in the gas markets will lead fairly directly to demand for shipping services. Given favorable economic conditions, a growth of around 3% per year is anticipated. **(Source : Gastech** 94).

- in addition to LPG itself, LPG carriers may also ship other chemicals in particular Ammonia (11.5 million tonnes shipped in 1993) and petrochemical gasses (ethylene, propylene, butadiene and VCM, with around 4 million tonnes traded in 1993).

Ž The outlook for ammonia (largely used in fertilizer production) is reportedly very good, but dependent for growth largely on the expansion of the supply sector, with new production plants in Oman, Quatar, Trinidad and Venezuela planned for the next five years. **(Source: Clarkson Research).**

- There is also optimism in the petrochemical trades, following a downturn in the recession early in the 1990s. There is a significant shift in the trade in this sector however, driven by the trend for value adding at source which is leading to a slowdown in long haul shipments. The opening of a new petrochemical complex at Bandar Khomeni in Iran in 1994 is a good example of this with domestic production replacing long haul trades to traditional petro-chemical producers.

FLEET DEVELOPMENT

- In general terms, the gas carrier fleet is reasonably well in balance and fleet growth will be driven by trade growth as described above. The exception is very large vessels where a surplus has built up and where lower growth rates are expected.

- The development of over-capacity in the very large gas carrier sector illustrates the danger in general of speculative over-ordering in the fleet as a whole. A number of owners built at prevailing low prices, in the anticipation of the retirement of ships after 15 years of operation, reflecting their original anticipated design life. Ships have continued trading long beyond 15 years however, with a resulting increase in over-capacity. This has limited freight rates in this sector.

Ž 13 gas earners were scrapped in 1994, with an average age of 25 years.

MARKET CONDITIONS

- Optimism has returned to the LPG trades, following the end of the recession and is focused on improved economic performance and the opening up of new markets.

- Figure 6.19 shows how the surplus in the fleet has developed over the past two years, In most sectors, the fleet has been in balance, but for very large ships a surplus of between 200,000 and 300,000 cubic metres has built up, representing around 5% of the fleet. This will suppress demand in this sector until a balance is restored.

- Figure 6.20 charts freight rates in the period since 1990. Rates fell in all sectors during the recessionary period, but since the start of 1993 recovery has been seen.

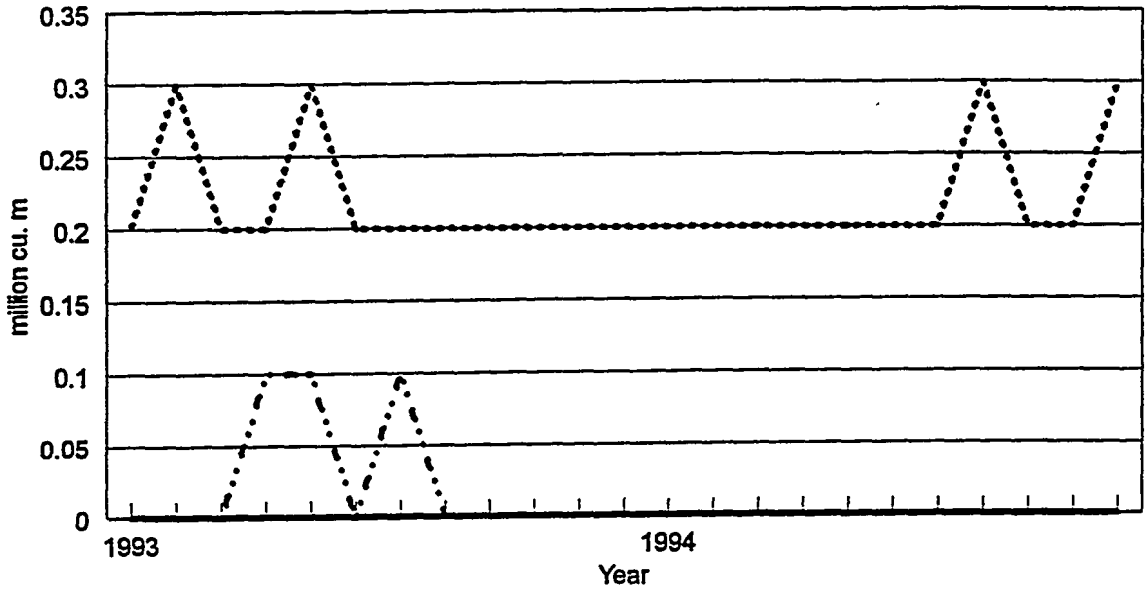
FLEET GROWTH FORECASTS

Ž Based on good balance, and the expected gradual improvement in the market due to improved economic conditions and the opening up of new markets, a gradual but steady growth is expected in this sector, as follows:

	1996 to 2000		
Dwt	**Low**	**Base**	**High**
5,000 to 10,000	**2.5%**	**3%**	**3.5%**
10,000 to 20,000	**2.5%**	**3%**	**3.5%**
20,000 to 40,000	**2.5%**	**3%**	**3.5%**
40,000 to 50,000	**2.5%**	**3%**	**3.5%**
50,000 to 60,000	**1.5%**	**2%**	**2.5%**
60,000 +	**1.5%**	**2%**	**2.5%**

Larger sizes are anticipated to grow more slowly, due to adverse fleet balance.

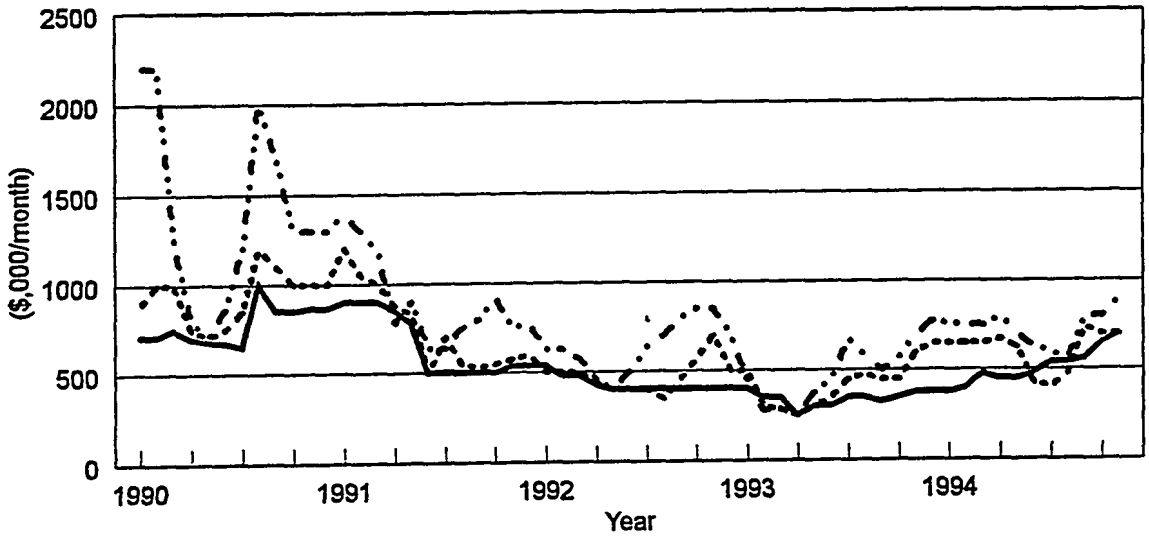
Figure 6.19 : LPG CARRIERS - SURPLUS



[Source: L.S.E.]

Figure 6.20 : LPG GAS CARRIER CHARTER RATE

(1 year)



[Source : L.S.E./ APAI]

4.4.10 LNG Gas Carriers

TRADE FACTORS

- Environmental issues are having an impact on the shipping industry and in terms of energy consumption the move towards natural gas as a cleaner alternative to petroleum products is increasing.

- The advantages of using LNG over nuclear power means that the use of natural gas consistently attracts worldwide attention and is expanding rapidly, as can be seen in the following table:

World Natural Gas Consumption (million tonne OE)

		% Change
1983	**1,330**	
1984	1,434	7.8%
1985	1,479	3.1%
1986	1,483	2.7%
1987	1,562	5.3%
1988	1,637	4.8%
1989	1,710	4.5%
1990	1,760	2.9%
1991	1,772	0.7%
1992	1,759	- 0.7%
1993	1,787	1.6%
1994	1,805 *	1%

Source: BP Statistics, * JAMRI forecasts

The average rate of growth in the 10 year period to 1993 was 3.17% but a significant slow-down can be seen during the recessionary period in the first half of this decade (as with most trades).

- During 1994 there were further advances in consumption and import volumes. The first three quarters saw consumption in Europe up by nearly 5% and imports by 4%, while in Japan consumption and imports alike rose by 7%. This suggests that the recovery from the recession has commenced.

The existing markets are well developed, both in terms of supply and consumption. Major gas reserves are located in the following countries **(Source: ISL).**

	Proven Reserves (billion cubic metres)
Former USSR	56,515
Iran	20,659
Qatar	7,075
United Arab Emirates	5,790
Saudi Arabia	5,246
United States of America	4,670
Venezuela	3,648
Algeria	3,622
Nigeria	3,396
Iraq	3,099
Total (majors)	113,723

These countries account for 80% of the world total. Proven reserves have risen by on average 8% per year between 1974 and 1993, and new sources of supply are being continuously developed.

- Volume of world LNG trades by sea accounts for approximately one quarter of the total trade volume. Pipelines are, and will remain, the most efficient supply system.

- At present there are a number of LNG projects awaiting final investment decisions in Trinidad, Nigeria, Ras Laffan and Oman and it may also be that some alternative schemes may make the headlines in the short term if the economics stand up to scrutiny and enough economic gas becomes available.

Ž The trade routes at this time are well established and include no more than 11 origins and destinations in the main routes, as **follows (Source : Clarkson Research).**

LNG Carrier Main Trade Routes

Source	Destination
Abu Dhabi	Japan
Algeria	Belgium
Australia	France
Brunei	Spain
Indonesia	**us**
	South Korea

Ž Expansion of trade will therefore follow economic growth in these countries, but in addition the opening up of new routes to supply energy needs in developing countries will also be important. For example, a major new contract was agreed earLier this year for Taiwan to import 520,000 tonnes of LNG this year, growing to 1 million tonnes in 1996, and then to 2.25 million tonnes per year. Developing Asia is seen as the growth market in this sector.

FLEET DEVELOPMENT

- The LNG newbuild sector is a small niche market with few ships built in recent years. The average annual output since 1970 has been three ships per year. However, because the fleet is so small increases in ship numbers are reflected in fairly high growth rates.

- in general the fleet is well established. The average growth rate over the last five years has been 3.5%, although the expansion rates seen most recently have reached 14.5%. There has clearly been a perception of tonnage requirement in the second half of the 1990s, with possibly some speculative ordering.

Ž In recent years, all fleet expansion has been in the large sizes. There are now very few vessels left in the smaller size bands, with those ships remaining having an average age over 20 years, with 22 vessels currently on order, representing 28% of the existing fleet.

- The heavy ordering of vessels during 1993/94 and the very low scrapping rate (one ship in 1994), has left a large portion of tonnage to be delivered until the turn of the century. The ultimate age of these ships is still being debated, but it may be that some current orders anticipate future scrapping,

MARKET CONDITIONS

- The large number of LNG projects awaiting clarification, combined with the signing of major new contracts indicates a sound short-medium term future for the shipping of LNG.

Ž Fleet surplus has fluctuated between 8% and 14.5% over the last five years, but currently surplus is down, reflecting an improvement in demand (See Figure 6.21). Almost all of the surplus in the larger size bands above 80,000 cubic metres and the current order book is worrying from this viewpoint, with most orders being for larger ships.

FLEET GROWTH FORECASTS

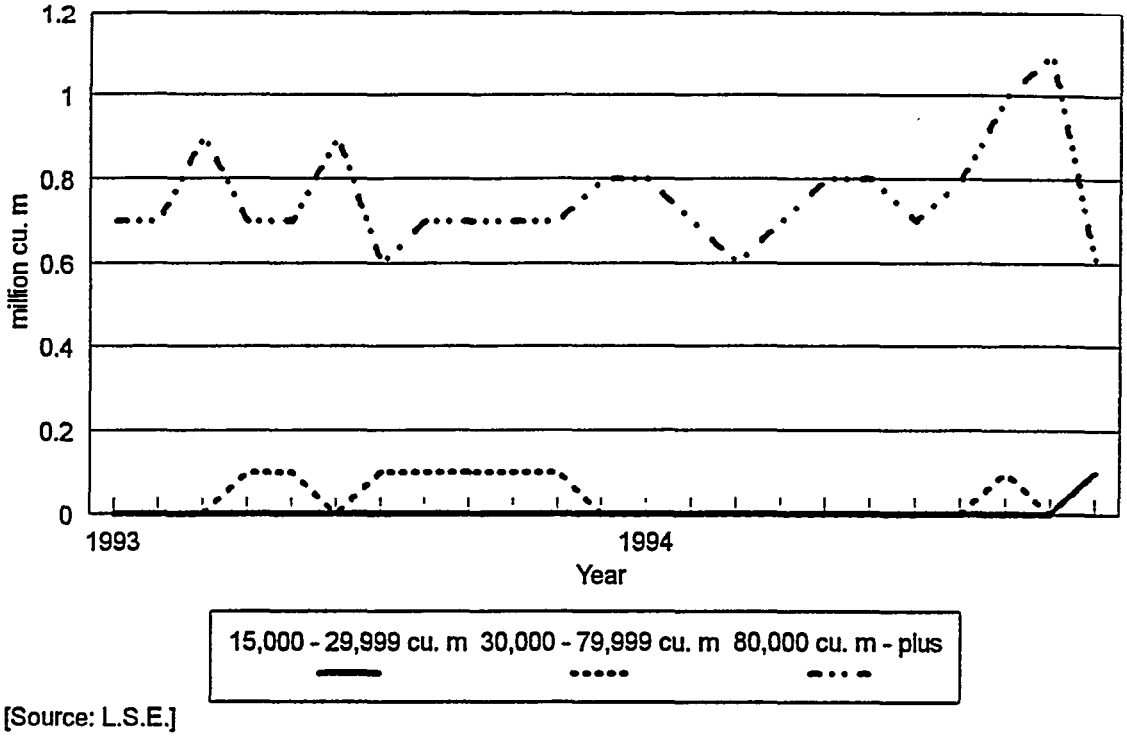
- The maturity of the LNG fleet combined with the predicted increases in trade growth indicates that the LNG fleet is likely to grow further over the next 10 years, with the highest rates seen in the larger size bands.

Ž LNG carriers are generally built with specific trades in mind, as an integral part of the transport system. New demand will be generated by expansion in existing trades and the opening up of new routes, but over-capacity as seen at this time must be avoided.

• Based on this, the forecast growth rates areas follows:

	Growth Rate (1996 - 2005)		
Dwt	**Low**	**Base**	**High**
10,000-30,000	**1%**	**2%**	**3%**
30,000-60,000	**1%**	**2%**	**3%**
60,000-70,000	**3%**	**4%**	**5%**
>70,000	**3%**	**4%**	**5%**

Figure 6.21 : LNG CARRIERS - SURPLUS



[Source: L.S.E.]

6.4.11 Ferries

Ž This is the most difficult sector of the market to forecast, due to its highly fragmented nature. Ferries are almost solely built for specific routes, and as such detailed forecasting would involve analysis of all potential markets, something that is likely to be impossible in any practical sense.

• Despite this, it is interesting to note that some speculative builds have taken place, notably the 24 ships 'superflex' ferry contract placed with North East Shipbuilders (UK) in the late 1980s. This contract failed, and some of the ships have been difficult to place.

Ž There are some main identifiable routes/regions, including:

- Canada (east and west coast)
- Baltic
- Mediterranean
- North Sea/English Channel
- FSU (including Black Sea/Caspian Sea)
- Indonesia
- China (including Hong Kong).

Beyond this however, there are a huge number of local routes and trades all around the globe.

Ž In general terms, the demand for ferries will be stimulated by population growth and economic growth, with the opening up of new markets in developing countries. Indonesia is a good example where existing inadequate (and often dangerous) ferries will be replaced gradually as the country develops.

• There are a number of complexities in this sector that merit note. Firstly, the extent of protectionism exhibited in the newbuilding markets, and secondly impending legislation regarding ferry safety.

Ž Ferry routes are often regarded as infrastructure development rather than on the basis of the commercial construction of new ships. Many routes are non-profit making or even subsidized (sometimes heavily) to provide a service to local inhabitants. This is most often the case with intra-country services rather than inter-country services, but is by no means solely limited to this sector. Because of this factor, ferry construction is often Government (or quasi-Govemment) financed, and this is often linked to a requirement that ships be built in domestic shipyards. Canada is a good example of a country where this practise is undertaken and the Jones Act ensures a similar result in the United States.

Ž In the wake of a number of much publicized disasters (most notably the Herald of Free Enterprise and the Estonia), ferry safety (ie, **RoRo** ferry safety) is currently being debated by the IMO with a view to legislation to improve ferry stability. The results are due to be known before the end of the first half of 1995.

Ž At this time it is only possible to speculate as to what the results might be, but in the opinion of the authors of this report over-optimistic assumptions of the wholesale scrapping of the ferry fleet are unlikely to be realized and are to be treated with great caution. Similar potential was voiced prior to the emergence of double-skinned tanker legislation, and the anticipated market never materialized, with the grandfathering of the existing fleet. A similar situation should be expected in the ferry fleet, although with the added complication that retro-fitting of corrective features is both feasible and likely.

- Owners are reluctant to commit to any solutions at this time, as all measures will have an economic impact on ferry services. Ultimately, a compromise will have to be reached and owners are likely to be required to take measures to achieve minimum damage stability requirements.

- There are a large number of proposed solutions to improve ferry stability, of more or less practical application. As a minimum, it is likely that strengthened shell doors and visors will be required, along with some arrangement to enable water to a specified depth to be tolerated on the car deck without capsizing the ship. This is most likely to require sub-division of the car deck, and a number of patented solutions to this problem have been developed.

Ž The ferry fleet is generally well established, and is expected to grow only fairly slowly. The exception to this is the large sector (so-called super-ferries), which has seen far higher growth rates in recent years, and is still in the development phase. These ships are generally found in the more developed regions, in particular Northern Europe and Canada.

- Based on the above, the following forecast rates of growth are proposed for ferries:

Fleet Growth, 1996 to 2005

GRT	Low	Base	High
<5,000	2.5%	3.5%	4.5%
5,000-10,000	2.5%	3.5%	4.5%
10,000-20,000	2.5%	3.5%	4.5%
20,000+	4%	5%	6%

6.4.12 Passenger Ship

TRADE FACTORS

- The passenger ship market, predominantly made up of cruise ships, is one of the fastest growing segments of the shipping industry.

Ž The cruise industry, in line with other specialized sectors of the shipping industry, tends to be marginally product driven. There has been virtually no scrapping of old tonnage to date and potential demand indicators tend to be disregarded in favor of the theory that the product generates its own market.

- Figure 6.22 illustrates how world cruise shipping demand has varied between 1987 and 1994, with the average annual rate of growth during the period standing at 11%, although over a more recent period the growth rate has been a more moderate 4.5%.

- In terms of trade deployment the Caribbean has been the most popular region, consistently attracting the biggest share of the market (approximately 40%). Europe, and in particular the Mediterranean, is the second major area for cruising, accounting for approximately 20% of the market. Cruise capacity based around the US and Canadian West Coast has increased over the last decade to account for 15% of the market, whilst the market in Asia and Australasia is an area that is currently expanding in terms of cruise ship capacity.

Ž When the market is overviewed, the importance of the mature traveler is established. Whether this is due to a better awareness of travel, or simply a function of age is undecided. However, if it is the latter, then the fact that by the turn of the century the age profile of OECD residents will be significantly higher than at present, will mean further growth in cruise shipping.

- Based on past demand and future trade factors, industry analysts have developed the following predictions.

	No of Passengers (millions)	
	US Market	**Total**
1994	4.5	5.73
1997	6.0	
2005	9.4	11.55

Sources: G P Wilde Ltd and Ocean Shipping Consultants

These predictions correspond to an annual growth rate of 9.9% over the next decade for the US market, and for the total fleet a rate of approximately 9%.

FLEET DEVELOPMENT

Ž Figure 6.23 illustrates how the cruise and passenger ship fleet has varied since 1980. The passenger ship fleet is still in its growth phase, albeit with fairy slow rates of increase.

- Building of passenger vessels proceeded at a steady rate throughout the 1970s and 1980s with the average rate of deliveries over this period being nine ships per year (average annual growth rate : 3.9%). Between 1980 and 1990 the passenger fleet grew at a slightly lower rate of 3.2% per annum, but the significant growth of the cruise market over the last five years has led to an increased growth rate of almost 4.5%.

- The market for large cruise vessels has grown particularly strongly. The following table estimates the average annual growth rates for each sector over the period 1990 to 1994:

GT	**Average Annual Growth Rate**
<5,000	2.7%
5,000 to 10,000	3.1%
10,000-20,000	4.2%
20,000-50,000	4.2%
>50,000	11.5%

- The large sector is very much in a growth phase, with the growth rate showing no signs of slowing. At present there are 59 passenger ships on order.

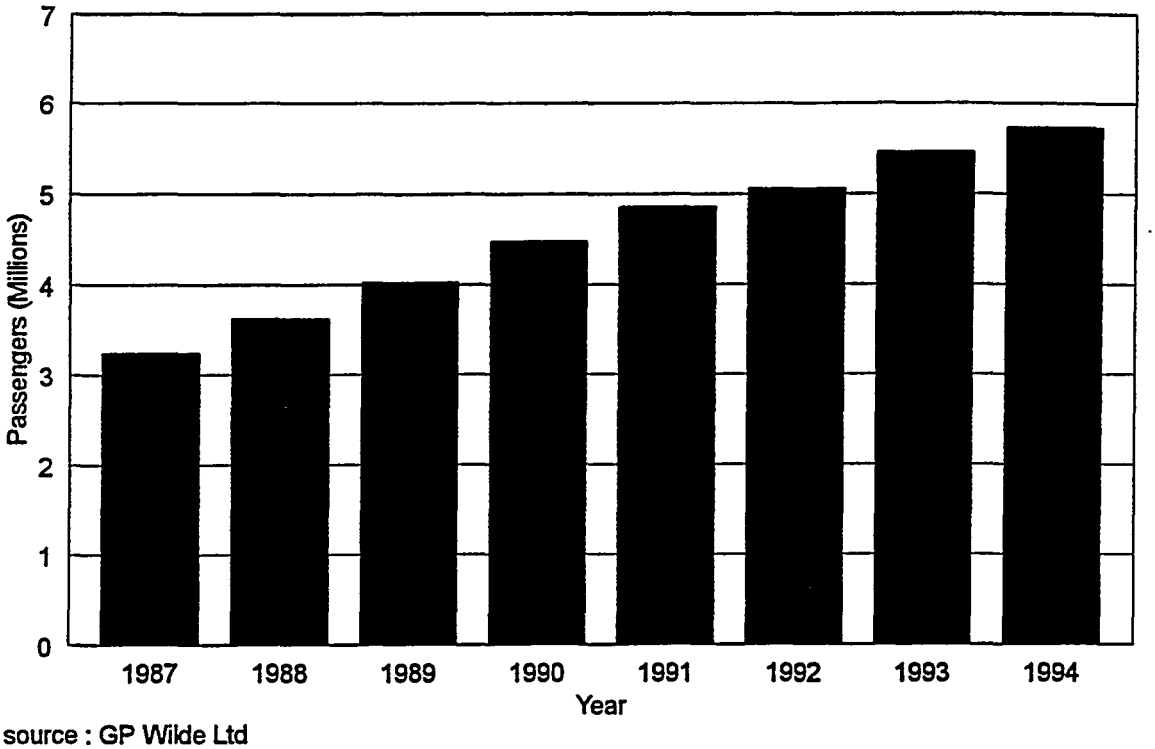
Ž In terms of scrapping, there has been a significant fall in the number of ships broken up:

	Passenger Ships Broken Up
1985	26
1986	29
1987	28
1988	31
1989	29
1990	19
1992	12
1993	13
1994	10

(Source: ISL Shipping Statistics)

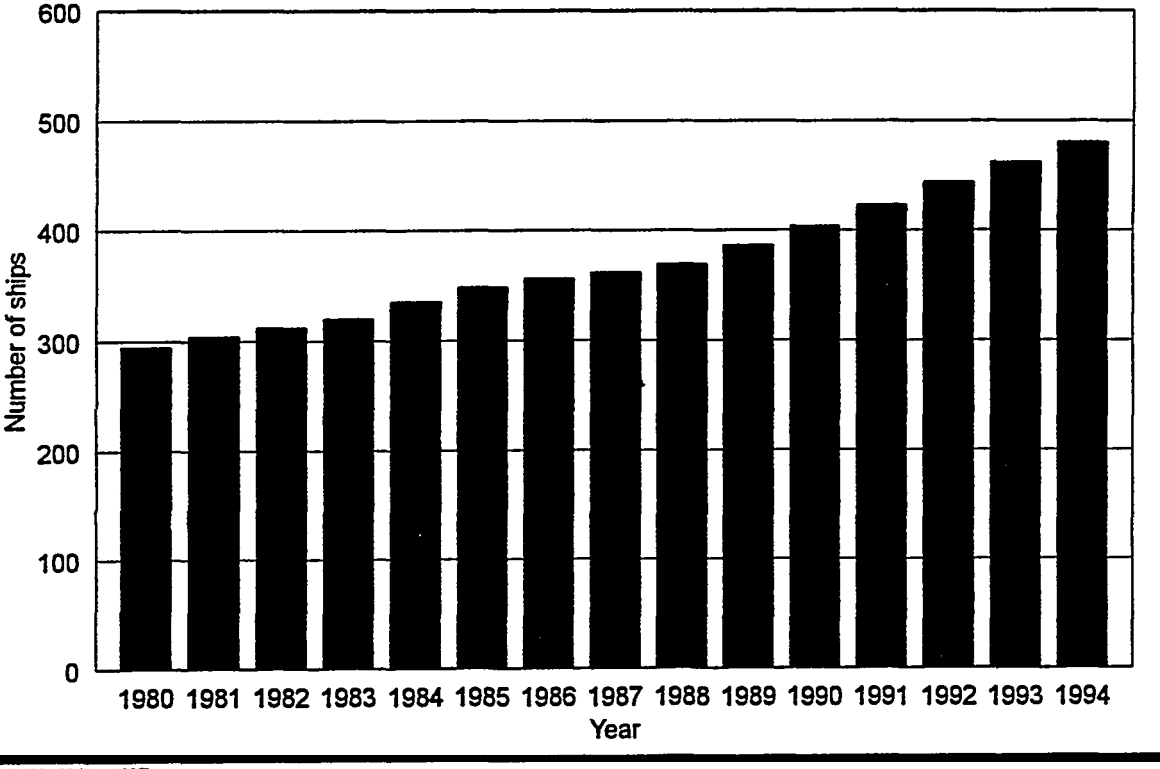
- The current fleet of 478 ships has an average age of 21 years. However, the very low scrapping rate is primarily a result of the prohibitive costs of newbuilding to all but the major operators, with a situation that means even at 60 years old, veteran ships can be still in service.

Figure 6.22: WORLD CRUISE SHIPPING DEMAND (1987-1994)



source : GP Wilde Ltd

Figure 6.23 : PASSENGER FLEET DEVELOPMENT (1980-1994)



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- This is a phenomenon unique to the cruise market. The majors feel impelled to add ever more innovative and expensive ships to attract an increasingly demanding clientele, whilst older ships are passed on for conversion and refurbishment. Conversions are an attractive alternative to newbuilding for the minor players, which results in the rarity of this fleet sector reaching the scrapyard.

MARKET CONDITIONS

- Figure 6.24 illustrates how fleet surplus has varied since 1988. As can be seen from the diagram there has rarely been more than 2% of the fleet in lay-up, with the average fleet surplus over the last 7 years standing at 1.7%.

- it should be remembered that the cruise industry is at its height at mid year and as a result surplus tonnage increases during the winter months.

- Some critics have cautioned against over-tonnaging in the passenger and cruise ship sectors, but somehow the market, particularly in the US, keeps on growing.

- However, some caution is well advised. The life cycle of the cruise fleet could exhibit “fashion” tendencies, and the potential of cruise markets to fall out of fashion is ever present.

- Discounting in the cruise industry is expected to decrease in the latter half of the 1990s, at least in the size of the discount offered as the supply/demand balance improves. Nevertheless, discounting remains an important influence on the market, and is the most likely reason for the lack of coincidence of the recession and fleet expansion, although contributing to the decline in profit margins of many of the cruise lines.

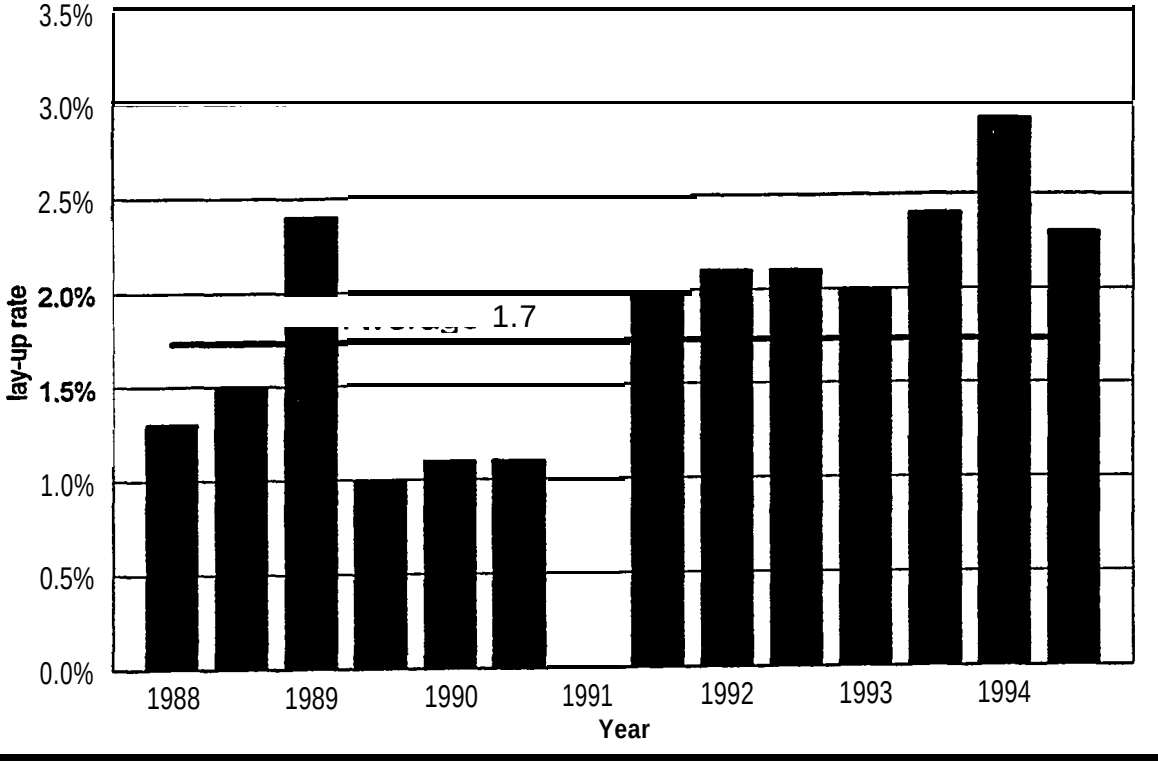
FLEET GROWTH FORECASTS

- Based on the above, the growth rates seen previously are likely to continue, with the largest size band increasing most rapidly.

- The predicted growth rates are:

	1996-2005		
GT	Low	Base	High
<5,000	2.0%	3.0%	4.0%
5,000-10,000	2.0%	3.0%	4.0%
10,000-20,000	3.0%	4.0%	5.0%
20,000-50,000	3.0%	4.0%	5.0%
>50,000	8.0%	10.0%	12.0%

Figure 6.24: PASSENGER SHIP LAY UP RATE (%) 1988-1994



6.4.13 Cargo RoRo

TRADE FACTORS AND MARKET CONDITIONS

- RoRo ships carry general cargo, and the fleet developed, as with containerization, as an alternative to traditional break bulk general cargo. In addition, it should be noted that RoRo vessels often have an additional strategic role, for example, within military sealift in the US. This function was also very popular in the former Soviet Union, with ramps designed for beaching tanks, in addition to offloading RoRo cargo.

- The level of trade has been remarkably constant in recent years, as evidenced by the following ship sailing data (Source: Lloyd's Shipping Economist).

	Million Dwt
1991	59.6
1992	58.9
1993	57.5
1994	59

- Market conditions are currently reasonably good. Fleet surplus as presented in Figure 6.25 is low at 300,000 dwt or around 4.5% of the fleet, and freight rates follow the general progress of the Baltic Freight Index, as described earlier.

- The main RoRo trades are strongly linked to the pattern of ownership, with the most important regions being the US, Canada, Western Europe, Japan and in developing regions.

- With respect to forecast trade growth, the projected growth rate of 5.5% per annum discussed earlier for general cargo is relevant. Unlike conventional carriers however, the fleet is not shrinking and a moderate rate of growth in demand can be anticipated, although this will be secondary to containerization which will maintain its progression to dominate general cargo trades.

FLEET DEVELOPMENT

- The RoRo fleet is well into the mature phase, and coupled with a surplus, albeit small, only low rates of growth are anticipated.

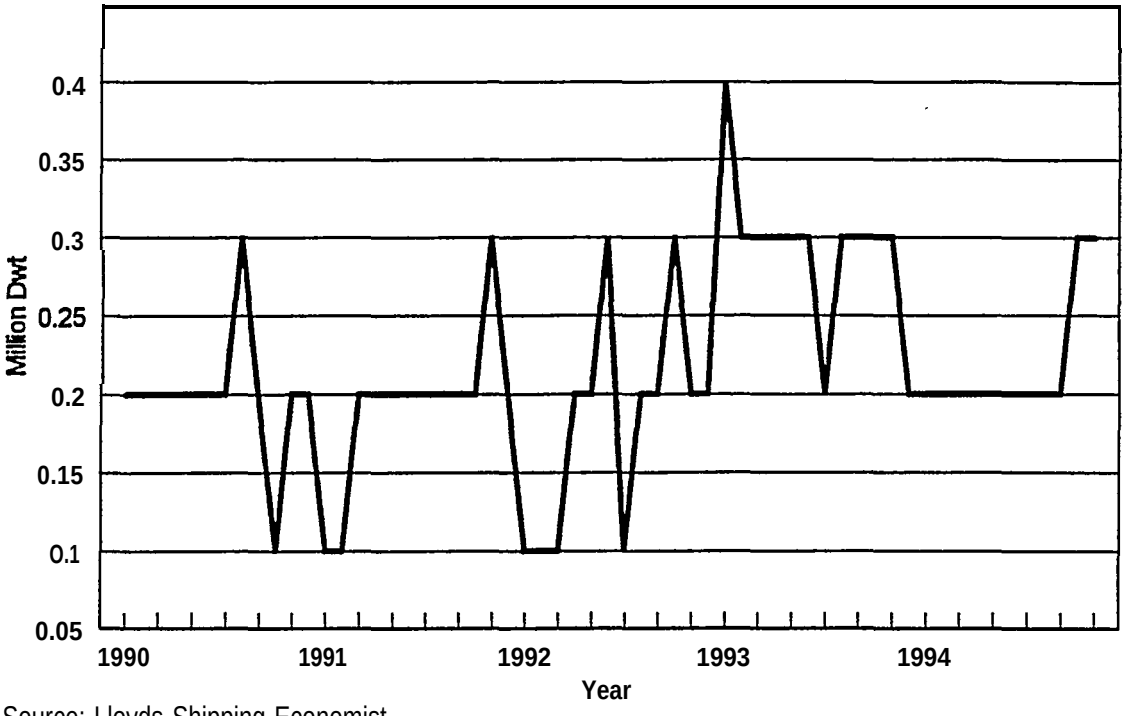
- The most popular size is expected to continue to be in the range between 5,000 and 20,000 dwt. For the smallest and largest sectors (in particular for ships over 40,000 GT), the expected development is slow.

FLEET GROWTH FORECASTS

. Based on the above, the following forecast of fleet growth is proposed:

	1996 to 2005		
GT	Low	Base	High
<5,000	0.5%	1.5%	2.0%
5,000-10,000	2.5%	3.0%	3.5%
10,000-20,000	2.5%	3.0%	3.5%
20,000-40,000	0.5%	1.5%	2.0%
40,000 +	o	0	1.0%

Figure 6.25: RO/ROS TOTAL SURPLUS



Source: Lloyds Shipping Economist

6.4.14 Car Carriers

TRADE FACTORS AND MARKET CONDITIONS

- There are two main factors affecting the car carrier trades at this time: a downturn in demand due to the recession, and the increasing use of 'transplants": in-country manufacturing units.

- The impact of the global recession has been felt strongly in the car sector. Between 1988 and 1994 output in the industry fell by an average of 1.25% per annum, and exports by around 1% per annum.

- The impact on car carrier operators is significant, with around one million less cars exported in 1994 than in 1988, and some scrapping and lay-ups have resulted, although in general the fleet is reasonably well balanced.

- Some recovery has started to be seen, with the improvement in economic factors, but as yet consumers are cautious, and the recovery has been slow.

- The practise of creating transplants has had less of an effect than might have been expected, and the percentage of production of cars exported worldwide has remained reasonably constant at around 40%.

- Transplants refers to the increasing tendency for car producers, lead by the United States and Japan, but now with Europe following, to move units of production to consumer regions. These new plants undergo a development cycle from branch plant to autonomous units, eventually both exporting and producing local designs.

- Thus, the original export trades are replaced by new trades from the transplant, the major effect being a reduction in voyage lengths, with a greater tendency to short sea trades. This is not always the case however, with, for example, Honda exporting to Europe from the United States, and Mercedes Benz planning to do so.

- In addition, to some extent the traditional Japanese export trades are being replaced by new trades as developing car producers emerge. Examples are Hyundai and Kia from South Korea and Proton from Malaysia. Other developing exporters will emerge, for example, Volkswagen in China is likely to build towards export markets at some point.

- Thus, whilst in the short term car carriers have seen something of a crisis, given a prolonged economic recovery the sector is forecast to improve gradually, in line with demand for new cars.

FLEET DEVELOPMENT

- The car carrier fleet is in the mature phase, and low levels of growth only are anticipated, in line with the growth in trade.

- Given the downturn in trade in recent years, and the lag in the recovery of the car market behind the general economic recovery, the growth of the fleet is forecast to increase in the second half of the forecast period.

FLEET GROWTH FORECASTS

- Based on the above, the following average annual growth rates are forecast for the car carrier fleet:

1996 to 2000			2001 to 2005		
Low	Base	High	Low	Base	High
2%	2.5%	3%	2.5%	3%	3.5%

7. ULTIMATE AGE, SCRAPPING AND LIFE EXPANSION

7.1 GENERAL

One of the most important determinants of future newbuilding demand will be the age at which ships will be scrapped. If scrapped ships are not replaced then the fleet will shrink and whilst some sectors of the fleet may need to shrink from time to time to restore a balance in the shipping market, the fleet in general is likely to continue to grow in line with growth in world trade.

The factors that affect the decision to scrap a ship are outlined in detail below. In summary, the overlying factors are as follows:

- Age and condition of the ship, in particular in relation to special surveys.
- Legislative pressure, such as 0PA90, and other pressures such as port state control action against sub-standard ships.
- The performance of freight rates.

The assumptions made by other forecasters are outlined below, along with a historical review of average scrapping ages for various ship types, prior to outlining the assumptions to be utilized in the forecast.

7.2 AGE AND CONDITION

Ships undergo special surveys every five years, the aim of which is to ensure that the vessel is in good enough condition to trade for another five years. In other words, at the fourth special survey at 20 years, the surveyor has to be confident that the ship can maintain its integrity up to the age of 25 years. The severity of surveys increases as the ship ages, and the fourth and fifth special surveys (at 20 and 25 years old) are particularly demanding, and significant investment is generally required to get ships through these special surveys.

At one time it was speculated that ships were unlikely to economically pass the fourth special survey point, due to the high cost of bringing ships up to standard. This has demonstrably not been the case and most ships are managing to get through the 20 year barrier. Figure 3.11 (in Chapter 3 of this study) presents the expected frequency of fourth and fifth special survey periods, based on the current age profile of the fleet. The fourth special survey peak has now been passed and the fifth peak has yet to build up.

On the basis of this, it is likely to be the fifth special survey that determines the life expectancy of much of the fleet (this is borne out by the statistical analysis of historic scrapping age presented below).

This prospect will be enhanced by the generally perceived poor condition of the world fleet. In periods of low freight rates (such as have prevailed for much of the past five years and more), the shipowner has to minimize expenditure to try to retain profitability. The principal elements of costs to the shipowner are:

- Capital Costs.
- Crewing Costs
- Insurance.
- Maintenance.

Capital costs are fixed, unless re-financing is an option. Crewing costs are rising: just about everything that can be done to minimize crew costs has been done, and the pressure is now upwards. Insurance costs, in the wake of an increasing number of much publicized losses and disasters, are also on the increase, and maintenance budgets have therefore come under significant pressure for reduction. The result is that the fleet is not only old, but is also (in many but not all cases) poorly maintained. This has lead to legislative pressure against aging sub-standard tonnage described in more detail in the next section of this chapter. This will ultimately lead to scrapping, although as yet, the effect has been only small; ships are still reaching the 25 year point.

Finally, it is worth noting a number of ship life extension schemes that have been proposed from time to time by Classification Societies, bearing in mind owners' problems with the increasing age profiles. Examples are Lloyd's Register's Condition Assessment Scheme, DNV's Condition Assessment Program.

These schemes offer to undertake a full survey of a ship, and specify the work that would need to be undertaken to improve the condition of a ship by one or even two special survey periods, if indeed this is actually feasible for the ship in question. The work will not actually guarantee any life extension however, only a minimum condition level at the time of survey. It is also very expensive - a minimum of $300,000 for a Lloyd's survey, for example, and the work that follows can run to many millions *where* major steelwork replacement is indicated.

Due to the high cost, and the fact that there are no guarantees with respect to ultimate age, the actual take up of so-called 'life extension' schemes has been very limited. Lloyd's report that between June 1989 (when the scheme was launched) and January 1995, only 55 assessments were undertaken. The American Bureau of Shipping drafted a life extension scheme in the late 1980s, but it has never been implemented due to lack of demand and Germanischer Lloyd report that only 1% of their vessels have taken up a life extension program.

Time is running out for these schemes. DNV specify that 20 years is the maximum age for vessels taking up the scheme, and whilst Lloyd's do not actually specify a limit, 20 years is also the implied maximum age for the proposed scheme. With increasing pressure on societies to improve standards, in the face of the declining condition of the worfd fleet, life extension is likely to remain a limited option.

In summary, life extension schemes have been taken up by a limited number of ships, generally those with a high level maintenance history, and the potential generally within the fleet is limited.

7.3 LEGISLATIVE PRESSURES

There are two aspects to this factor in the scrapping equation:

- The effects of legislation, in particular 0PA90 and IMO regulations, relating to double skin tankers.
- Port state control and other regulatory controls, restricting the proliferation of over-aged and otherwise sub-standard ships.

7.3.1 Double Skin Tanker Regulations

There are two main tranches of legislation: IMO Regulations and 0PA90. Basically they both have the same aim, that is to ensure that all new ships constructed will have double hulls and to gradually phase out older tankers with single skins.

IMO regulations require crude carriers of over 20,000 dwt or products carriers of over 30,000 dwt that are 25 years or older to have double bottom and sides. 0PA90 is more complex, with a range of targets for the maximum permissible age of single skin ships trading in US waters based on their size. The overall aim is to prohibit ships over 5,000 GT and older than 25 years from offloading at US ports by 2005. The exceptions to this are small ships, below 5,000 GT which must have a double containment system, irrespective of age, by 2015, and vessels of over 30,000 GT whose maximum age for trading with a single hull is set at 23 by the year 2000. The effects of this latter provision are likely to be limited however, by the fact that most larger ships trade to offshore ports (such as Loop) and are exempt from the act.

The trend to ensure that the future world tanker fleet is double hulled is well under way, ensured by the legislation that has been put in place. However, it seems unlikely that the legislation in place will have a significant accelerating effect on the normal cycle of scrapping, based on a ship's age. It will however, add to the pressure to scrap ships at or before the Fifth Special Survey (25 years).

There has been much speculation and discussion as to the technical and economic feasibility of retro-fitting double skins to existing tankers. The Japanese Maritime Research Institute made the following statement in a report on the potential changes in the fleet due to double skinning legislation in December 1994

"When account is taken of the age limit of 25 years old of a ship, the degree of corrosion of the hulls suffered by the ship by that time, and the degradation of steel materials and structural strength, it is economically infeasible for a single-hulled oil tanker which has been operated for many years to be retrofitted with the double-hull structure due to regulatory requirements implemented for safety purposes. For this reason, the application of the double-hull requirements to existing vessels is not likely to be readily adopted; hence, in reality, existing vessels will disappear from the field of operation in the form of either lay-up or break-up rather than being retrofitted".

This paragraph concurs with the general view of the market that technical and economic difficulties are likely to preclude retro-fitting for the vast majority of the tanker fleet, except in very specific circumstances.

7.3.2 Other Regulatory Controls and Market Pressure

A series of much publicized maritime disasters over the past decade, coupled with a general perception that the world fleet has been inadequately maintained during the prolonged freight rate recession, has lead to mounting pressure to phase out the large volume of ageing and sub-standard tonnage that is currently trading.

Pressure comes from environmentalists, insurers, charterers, labor and maritime organizations, Governments and a wide range of other sources, and the effect is mounting.

The most visible element of the pressure is the increasing scope and effectiveness of port state control measures. Port state control is rapidly gathering momentum in all areas of the world.

The US Coastguard was effectively the first body that controlled the activity of foreign shipping in national waters, in addition to controlling national tonnage. More recently, the Paris Memorandum of Agreement on port state control has been set up in Europe, with 15 European countries now signatory to the agreement, and recently the agreement was extended to include Canada. A similar agreement is being setup to cover the Pacific Rim and Oceania. Under port state regulations any ship can be detained if it is deemed to be unsafe to sail, either due to rendition or operational problems.

The condition of the fleet is generally perceived to be deteriorating. Around 80% of ships entering European waters are inspected. The UK Government reported in July 1994 that about 10% are detained. The Australian Maritime Safety Authority reported 92 vessels were detained during the first 8 months of 1994, compared to 72 vessels in the whole of 1993.

France and the UK have begun to publish lists of sub-standard ships that are detained and the US Coastguard maintains a list of owners who are targeted for inspection, ie, who are generally perceived to be below standard, which is available for inspection.

Pressure on sub-standard tonnage is continually increasing. Classification Societies are now also becoming involved, mindful of their responsibility for maritime safety, although only the French Society, Bureau Veritas, has as yet acted to any significant extent. The society is now making unscheduled and unrequested inspection visits, and has reduced the classed fleet so far by 5%. Other Societies are likely to follow suit.

The effect of this pressure has been to increase information available to insurers and charterers, and something of a two-tier fleet is emerging. This has not as yet in general been reflected in charter rates, but is reflected in the ability to attract cargoes and the proportion of time spent on charter. It is also increasing the pressure on scrapping.

7.4 HISTORIC SCRAPPING AGES

Table 7.1 presents a summary of the average age of ships broken up between 1985 and 1993, subdivided by type, based on Lloyd's Register data. In general, this table supports the 25 year scrapping assumption. The exceptions to this are:

- Passenger Ships, where an average life expectancy of 32.1 years is indicated. This reflects the standards of construction and maintenance of these ships, which have in general afar greater design life than cargo ships.

- Bulk Carriers have a noticeably lower life expectancy than other ship types, at 21.7 years. This is likely to be due to lower plate thicknesses resulting from the extensive use of high tensile steel in the late 1970s and 1980s and the generally poor condition of the fleet. In addition, low freight rates will lead to earlier scrapping.

- Container Ships appear to have a lower scrapping age based on these statistics, but this is based on a low sample size: the actual scrapping profile is not reflected in these statistics, and is unlikely in reality to be below 25 years.

These statistics are borne out by a more detailed review of the age of 353 ships scrapped during 1993, undertaken by Clarkson Research presented in Table 7.2. The overall average age was 24.4 years, but again with strong indications that 25 years is the threshold age. The slightly lower ages during the year shown are likely to be a result of low prevailing freight rates over that year. Certainly, the trend to scrap VLCCs before the Fourth Special Survey does not appear to have continued, and VLCCs are generally getting through the Fourth Special Survey, although often necessitating extensive amounts of work and renovation. In addition the average age of the 75 Bulk Carriers is slightly higher than the historical average at just under 25 years.

Table 7.1

AVERAGE AGE OF BROKEN-UP SHIPS BY TYPE DURING 1985-1993

(Ships of 300 grt/gt and over)

Year	Tankers	Bulk Carriers	Container Ships	General Cargo	Single Deck	Multi-Deck	Passenger Ships	Total
1985	20.9	20.1	23.1	22.3	25.2	24.8	35.3	23.2
1986	21.3	19.4	21.7	23.6	23.7	24.1	33.5	22.3
1987	24.4	19.8	24.9	23.8	24.6	24.2	34.3	23.5
1988	24.6	22.4	25.1	24.2	24.3	25.9	32.2	24.4
1989	24.9	23.1	27.2	25.5	25.3	27.0	31.6	25.6
1990	26.4	21.7	19.5	25.1	25.2	26.6	30.0	25.1
1991	25.3	22.0	19.0	24.8	27.4	25.8	30.3	25.5
1992	25.8	22.9	19.1	25.7	26.2	25.7	32.8	25.3
1993	24.7	24.0	22.9	26.4	28.1	26.0	28.9	25.6
Average	24.2	21.7	22.5	24.6	25.6	25.6	32.1	24.5

Source: Institute of Shipping Economics and Logistics

Table 7.2

DEMOLITION MARKET SUMMARY, JANUARY-DECEMBER 1993

(Analysis by Type/Size)

Type/Size	Number	Dwt	Age
Tankers			
VLCC	24	5,685,433	19.8
Suezmax	17	2,115,546	21.1
Aframax	15	1,218,978	23.7
Handy	57	1,523,763	26.0
Specialized cl OK	8	35,193	28.2
Total	121	10,578,913	23.9
Combos	12	1,743,084	21.2
Bulk Carriers			
Cape Size	14	1,742,339	21.5
Panamax	7	449,864	24.4
Handymax	10	400,135	24.2
Handysize	44	914,789	24.3
Total	75	3,507,127	23.8
Gas Vessels	12	136,561	25.2
Containers	4	65,048	25.3
Other Dry	129	1,814,351	25.4
All Vessels	353	17,845,084	24.4

Source: Clarkson Research Studies Limited

7.5 FORECAST ASSUMPTIONS

Based on the foregoing, the following assumptions are made with respect to the scrapping age of ships in the existing fleet

	Base Case (Years)	Low Case (Years)	High Case (Years)
Tanker	25*	25	24
Special Tanker	25	26	24
Bulk Carrier	24	26	22
OBO	21	23	20
General Cargo	25	27	23
Container	25	27	23
Reefer	25	27	23
LPG	25	27	23
LNG	25	27	23
Ferry	33	35	28
Passenger	33	35	31
RoRo	25	27	23
Vehicle Carrier	25	27	23

(*VLCC *23)*

It can be seen that the fifth special survey is in general taken as the scrapping point, with the following exceptions:

- The average age of VLCCs at scrapping has been assumed to be 23 years, reflecting a higher than average likelihood of scrapping at the fourth special survey point (20 years), due to condition and the high cost of getting through this survey.
- Scrapping age of combined carriers has been set at 21 years. Design concerns and generally poor condition leads to a trend for early scrapping in this sector.
- 24 years has been set as the average age for bulk carriers, due to the generally poor condition.
- Ferries and passenger ships are assumed to reach 33 years.

Three cases are given reflecting possible variations in the ultimate age of ships. The low case assumes that vessels will exceed the forecast life expectancy, leading to delayed replacement demand, and the high case assumes an accelerated scrapping program.

8. THE FUTURE DEMAND MODEL

8.1 OVERVIEW

For the purposes of predicting future shipbuilding demand, three scenarios have been examined:

Case 1: Low Case Low growth rates combined with ship life prolongation.

Case 2: Base Case Expected growth rates combined with the most likely scrapping policy.

Case 3: High Case High growth rates combined with accelerated scrapping.

The overall characteristics of the predicted forward demand are described in Figures 8.1 to 8.4, and Tables 8.1a and 8.1b. The characteristics are outlined below.

- Figure 8.1 shows forward demand projected to 2005, plotted along with actual output between 1972 and 1994. The forecast predicts a strong peak in demand around the turn of the century, declining thereafter to around current levels of output by 2005.

- The forecast level of demand is high, similar to peak levels seen in the mid 1970s. There is a good correlation between the three demand scenarios in this respect, although the magnitude and position of the peak varies slightly.

- The peak is very sharp, with a return to around the current levels of output by the middle of the next decade. This suggests that the opportunity for shipbuilders to generate a profit from high demand, and consequently high prices, is transient, and concerns with respect to over-capacity will return in the next decade.

- The level of demand in the base and low cases shows a fall below 1994 output in 1996. With order books currently rising the danger of over-ordering of speculative tonnage at low prices is present. This will suppress freight rates and reduce newbuilding demand until such time as scrapping picks up to compensate. (It must be kept in mind that this is a demand forecast, and that output may in fact exceed demand).

- The main generator for the forecast demand (and the cause of the cyclical peak) is replacement of obsolete tonnage, and a very strong increase in scrapping is required to accompany the demand forecast. The level of fleet growth forecast is shown in Figure 8.2, with the following total average annual growth rates:

Figure 8.1 :Past & Future Annual Demand

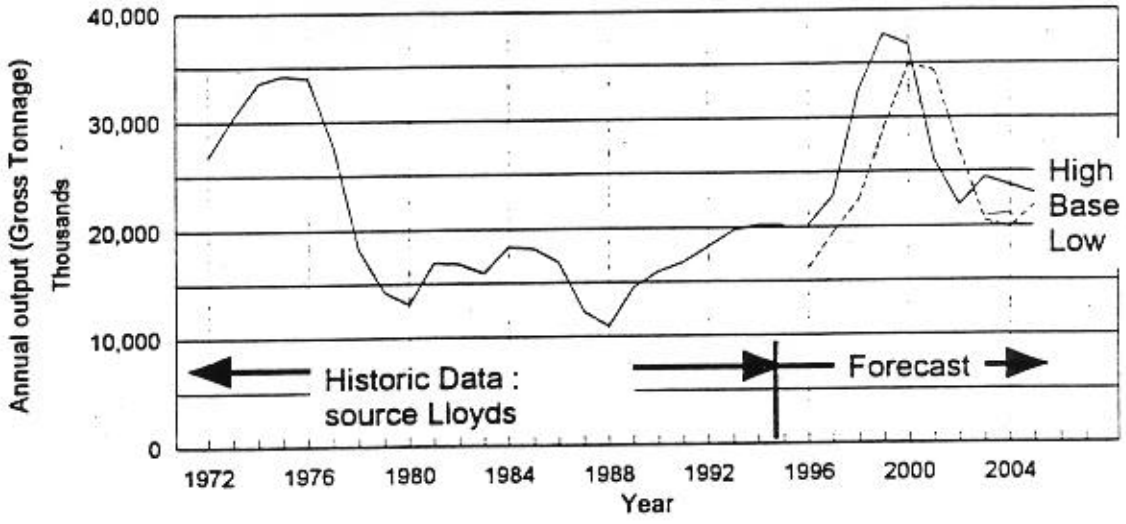
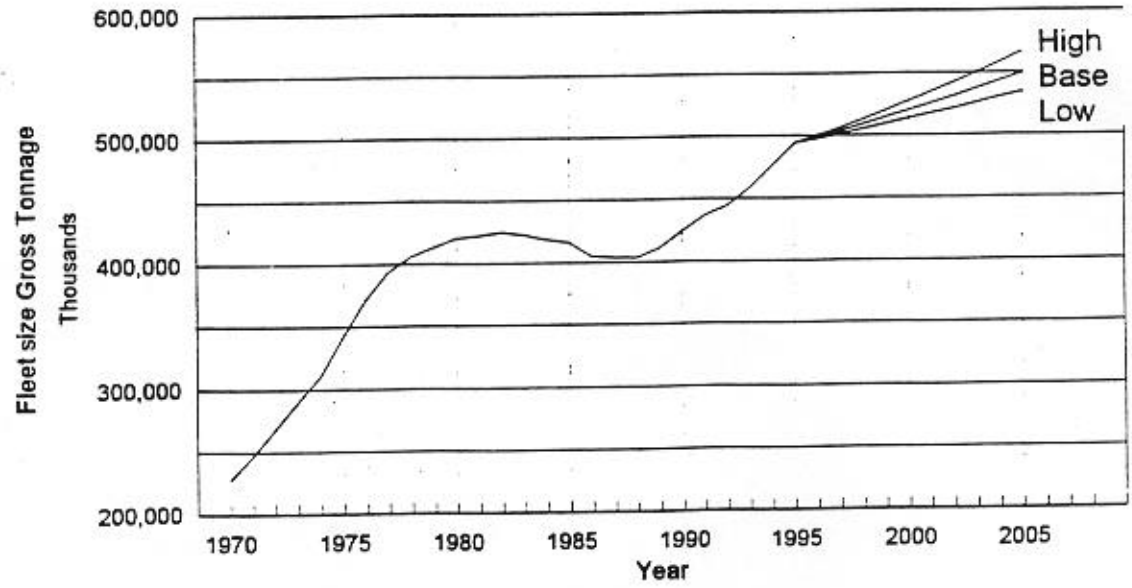


Figure 8.2 : Past & Future world fleet



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Low Case : 0.76% per annum
Base Case : 1.07% per annum
High Case : 1.28% per annum

- **The proportionate levels of demand are illustrated further in Figure 8.3, indicating that the majority of forward demand forecast in the peak is generated by replacement of obsolete tonnage.**

- Figure 8.4 illustrates three measures of demand utilized; deadweight, gross tonnes and compensated gross tonnes. Using tonnage (dwt or Gross) to measure demand may be misleading, as it is strongly influenced by tankers and bulk carriers. Gross tonnage is useful as a comparison with past output, and shipbuilding output is generally measured in gross tonnes. Again however, this may be distorted by larger ship types. This is illustrated by a comparison of Figure 8.5, showing outPut in terms of number of contracts, with Figure 8.1. It can be seen that the magnitude of the peak is significantly lower than seen with Gross Tonnes, and with the workload are evenly spread.

- Arguably the best measure of future output is compensated gross tonnes, as this is directly comparable between ship types and measures relative work content. This too has its drawbacks however, due to the limitations of the CGT system.

- Ultimately for shipbuilders, it is the number of contracts that is of most importance, reflecting the discrete nature of the business, rather than the divisible nature suggested by the other measures of demand. The average annual demand in the base case, along with actual deliveries in 1993 and peak forecast values are presented in Table 8.1a, the positioning of the peaks is illustrated in Table 8.1b, and the variation in the low and high cases is given in Table 8.1c. These statistics reveal a number of important strategic aspects that should be noted. These are outlined below.

Figure 8.3 : Future Demand : Base Case

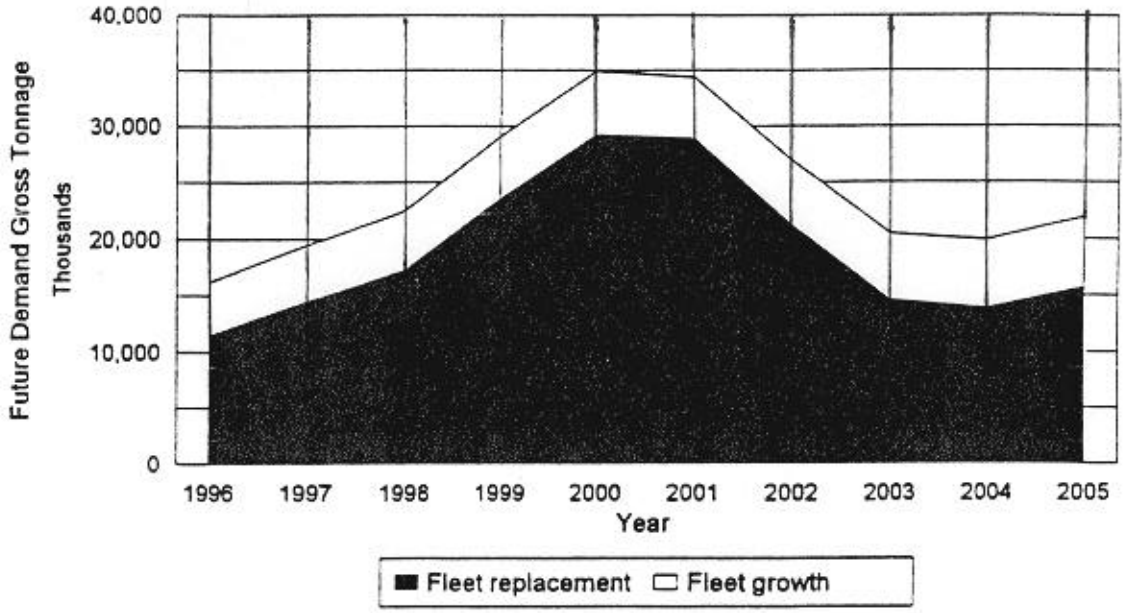

Figure 8.4 : Future Demand : Base Case

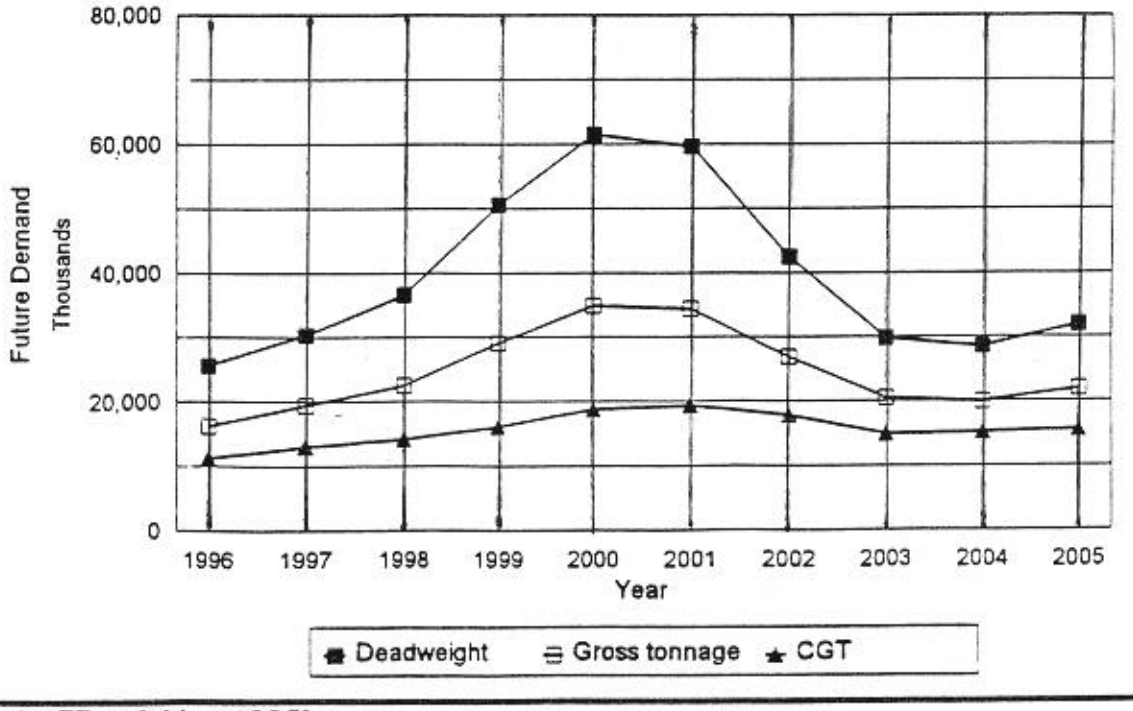

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Figure 8.5 : Output and Demand Forecast

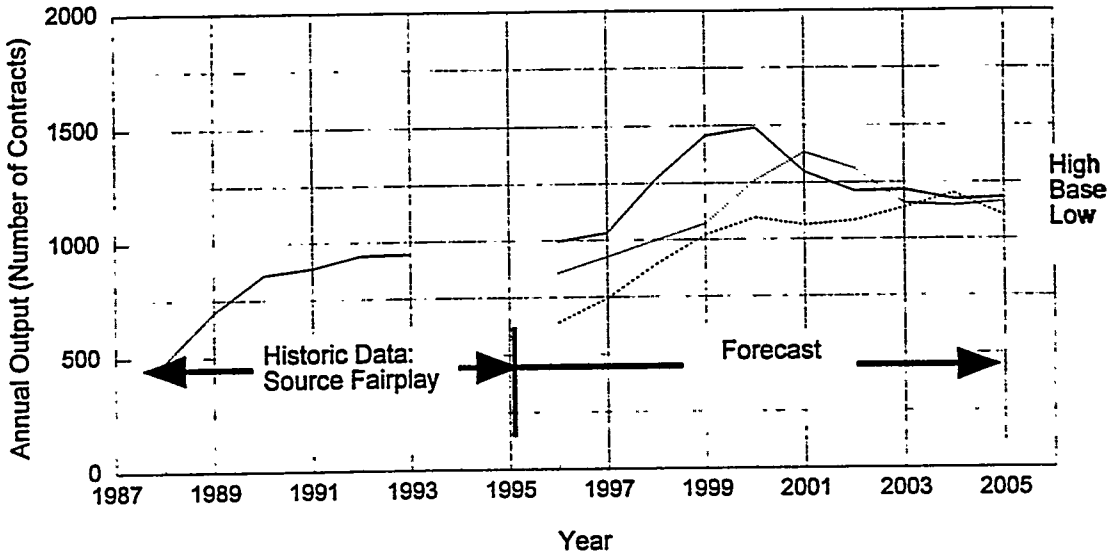

Table 8.1a

SUMMARY OF FUTURE DEMAND BASE CASE SENARIO

Ship Type	Deliveries 1993	Average Annual demand Number (Peak)	DWT	GT	CGT
Tanker	86	185 (324)	18,043,666	9,072,394	3,333,711
Chemical tanker	32	57 (66)	1,581,233	892,626	724,978
Bulk carrier	67	261 (410)	10,010,416	5,660,822	3,229,814
OBO	4	13 (23)	1,388,950	758,158	350,341
General cargo	37	216 (369)	2,750,036	1,828,787	1,911,393
Container ship	99	110 (129)	3,135,448	2,901,601	2,234,902
Refrigerated ship	43	51 (72)	451,923	411,640	750,793
LPG gas carrier	15	19 (31)	554,004	464,233	398,440
LNG gas carrier	5	7 (11)	435,910	546,679	339,580
Ferry	29	54 (87)	126,655	422,928	568,139
Passenger ship	18	33 (38)	105,111	474,099	888,862
Ro-Ro	25	92 (152)	806,963	688,457	619,177
Car carrier	14	29 (52)	299,708	432,277	289,853
Grand Total	474	1,127	39,690,023	24,554,701	15,639,983

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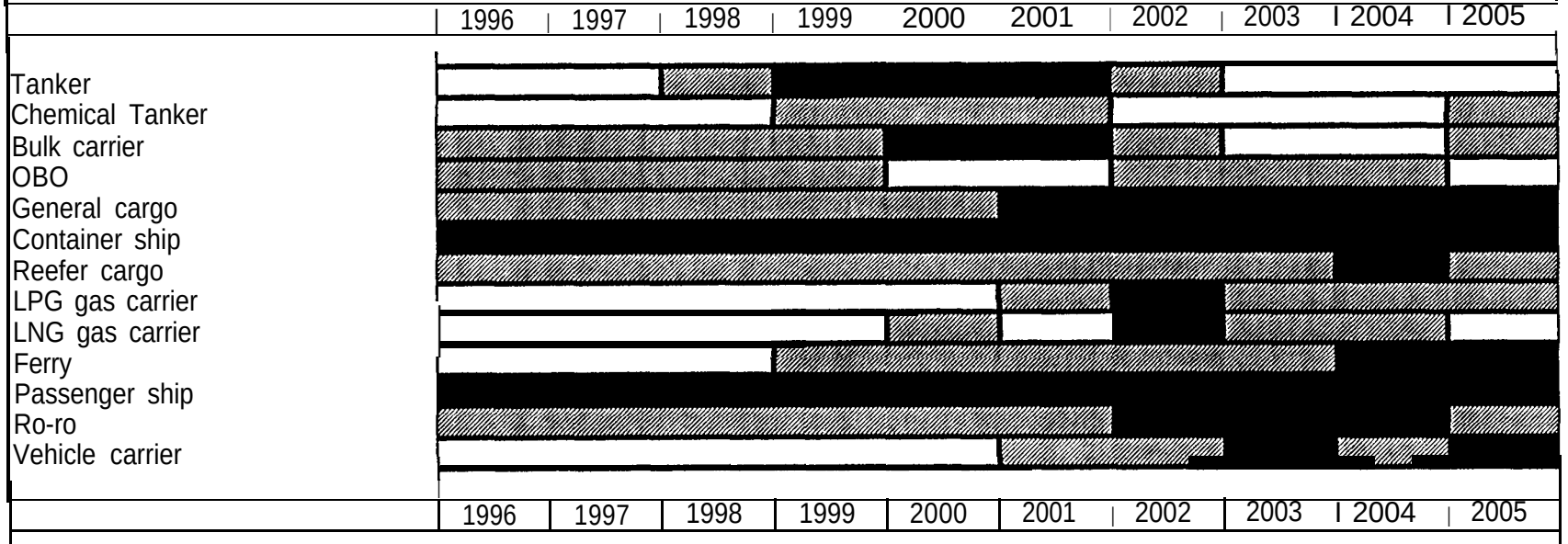
Table 8.1b

FUTURE DEMAND MODEL: PEAK PERIODS - BASED ON BASE CASE FUTURE **CONTRACTS**



Key :

- Low demand period
- Moderate demand period
- High demand period

[spfa198a 15-May-1995]

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Table 8.1c

FORECAST AVERAGE ANNUAL NUMBERS OF CONTRACTS

Ship Type	Base	Low	High
Tanker	185	177	199
Chemical Tanker	57	42	75
Bulker	261	241	281
OBO	13	18	12
General Cargo	216	208	205
Container Ship	110	90	122
Reefer	51	44	55
LPG	19	16	22
LNG	7	6	9
Ferry	54	36	77
Passenger Ship	33	27	40
RoRo	92	73	99
Car Carrier	29	22	37
Grand Total	**1,127**	**1,000**	**1,233**

- The average number of deliveries predicted per annum over the forecast period is 2.4 times the actual output in 1993 (base case). Having said this, the peak deliveries are very much higher than this, as described earlier.

- The high and low cases show a close correlation with the base case, with average annual demand 11% below and 9.4% above the base case respectively.

- The market divides into three sections from a volume standpoint, as follows:

Table 8.1d

BASE CASE DEMAND CHARACTERISTICS

Sector	Shiptype	Average Number of Ships per annum	% of Total	Average CGT (millions) per annum	% of Total
Volume	Tanker	185	16.4%	3.33	21.3%
	Bulk Carrier	261	23.1%	3.23	20.66%
	General Cargo	216	19.2%	1.91	12.22%
Total Volume Sectors		**662**	**58.7%**	**8.47**	**54.18%**
Intermediate	Chemical Tanker	57	5%	0.72	4.6%
	Container	110	9.7%	2.23	14.26%
	Reefer	51	4.5%	0.75	4.8%
	Ferry	54	4.8%	0.57	3.65%
	RoRo	92	8.2%	0.62	4%
Total Intermediate Sectors		**364**	**32.2%**	**4.89**	**31.31%**
Niche	OBO	13	1.1%	0.35	2.24%
	LPG	19	1.7%	0.4	2.56%
	LNG	7	0.6%	0.34	2.18%
	Passenger	33	2.9%	0.89	5.69%
	Car Carrier	29	2.6%	0.29	1.86%
Total Niche Sectors		**101**	**8.9%**	**2.27**	**14.53%**

It can be seen from Table 8.1d that the main three ship types account for almost 60% of anticipated contracts and just under 55% of the forecast capacity utilization. The subsequent five intermediate types raise the total contracts to over 90% and the capacity utilization to just under 85%. The five niche sectors account for under 10% of contracts and only 15% of capacity requirement.

- The characteristics of the individual sectors are as follows:

Tanker: A very major increase in demand is forecast in this sector, due primarily to the need to replace the obsolete fleet. This demand is assured to a large extent by the provision for grandfathering in legislation designed to phase out single skin tonnage. This sector makes up over 21% of forecast capacity utilization. The forecast peak of demand occurs in the period 1999 to 2001, with a very sharp increase in these years.

Chemical Tanker: A moderate increase in demand only is forecast in this sector, from 32 vessels delivered in 1993 to a forecast annual average of 57. The level of demand is anticipated to be fairly steady, with no significant peaks.

Bulk Carrier: Very high demand is forecast, due to the obsolete nature of the existing fleet, with a peak in 2000 and 2001, but with high level throughout the period. Over 20% of shipbuilding capacity is anticipated to be occupied in building bulk carriers.

OBO: This is forecast to remain a small niche sector, although with demand picking up from previous very low levels : it is likely that a number of owners will continue to favor this ship type. No great peaks are forecast, but with the highest levels of demand forecast between 1996 and 1999.

General Cargo: The high average age of this sector suggests that even despite the forecast decline in the fleet, very high levels of demand will be seen in this sector, building up to a peak after the turn of the century.

Container Ship: Container ship demand is forecast to increase to only slightly greater than the level of demand currently seen, and will be fairly steady at this level throughout the forecast period. From a strategic viewpoint this conclusion is important. New entrants into the market would have to gain market share at the expense of existing constructors, rather than through market growth, and this will be one of the most difficult sectors to penetrate, despite good demand.

Reefer: As with container ships, only a small increase in demand is forecast in this sector, although with a peak of demand at the end of the forecast period. This is likely to be a difficult sector to penetrate in competition with established specialist builders.

LPG: Demand in this sector is forecast to build up to a peak towards the end of the forecast period, but with little increase up to 2000. The level of demand is generally fairly low.

LNG: The timing of an upturn in LNG building follows a similar pattern to LPG, but remains very much a small niche sector.

Ferries: Demand for ferry newbuilding is forecast to build up to a peak towards the end of the forecast period, with replacement demand leading to a significant increase above current output levels.

Passenger: Demand is forecast to increase to relatively high and steady levels in this sector, although remaining a niche market.

RoRo: Demand for roro vessels is forecast to increase significantly, building up to a peak in the period 2002 to 2005. At the peak, demand is forecast to be six times the very low level of output in 1993.

Vehicle Carrier: Output is forecast to increase only moderately,. with this sector remaining very much a niche market, although building up to a peak towards the end of the forecast period.

- **As** a general comment it should be noted that the peak of demand forecast in Figure 8.1 is very strongly influenced by tanker and bulk carrier replacement. Container ship and passenger ship construction are forecast to maintain a fairly constant level of demand throughout, and other ship types are forecast to see peak demand in the second half of the forecast period, although overall demand is forecast to reduce over this period, as the tanker and bulk carrier peaks tail off.

- Finally, the ability of the global shipbuilding industry to absorb the very sharp peak of capacity is considered later in this study. It should also be noted however, that the capacity of the scrapping industry to cope with the anticipated level of demand and the capacity of the finance industry to provide capital to fund the newbuilding program must also be adequate, and there are some doubts as to this capacity. This potential problem, that these industries will lack sufficient capacity to support the forecast demand level, is discussed in full in the World Bank Discussion paper “The Maritime Crisis” by Hans J Peters.

8.2 DETAILED DEMAND ANALYSIS

8.2.1 Tankers

Figures 8.5a to 8.5f describe the demand for the three scenarios, in terms of gross tonnage and numbers of contracts, and Table 8.2 gives average anual demand. The following characteristics should be noted:

- The demand is highly peaked, driven by the phasing out of single-skinned tonnage. The VLCC sector is particularly transient, returning to a low level of demand by 2003.

- The suezmax/aframax market is also heavily peaked, and a more steady demand is seen in the handysize/handymax sectors and the small size below 20,000 dwt. This is where the greatest market will be, although opportunities exist in all sectors.

- The panamax sector is variable, with the model showing the market picking up again at the end of the forecast period.

- The peak years are forecast to be 1999 to 2001 in the base and low cases, but advanced by one year in the high case, assuming accelerated scrapping.

Figure 8.5a : FUTURE LOW CASE DEMAND - TANKER

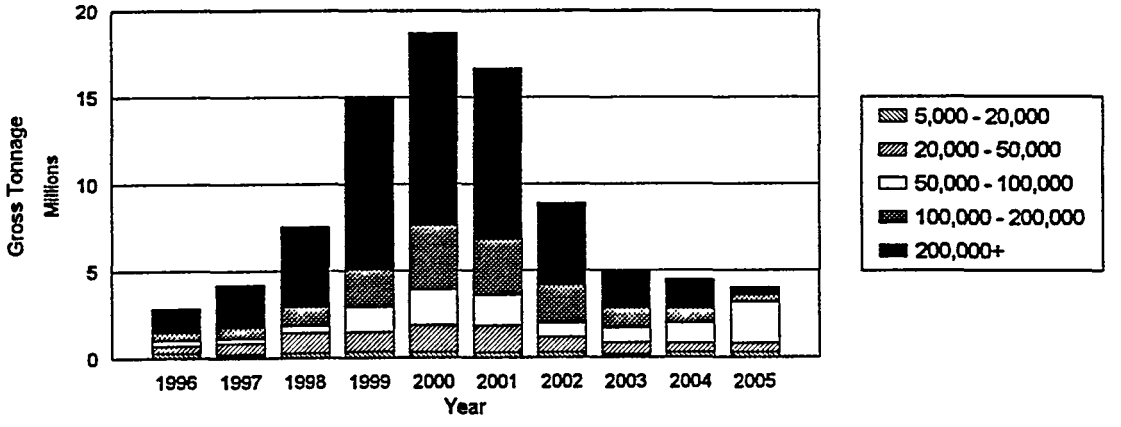


Figure 8.5b : FUTURE BASE CASE DEMAND - TANKER

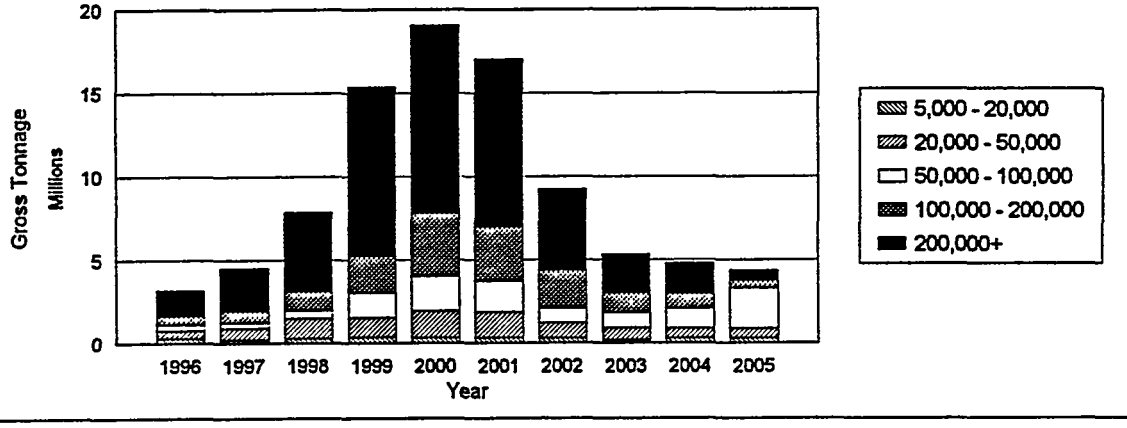
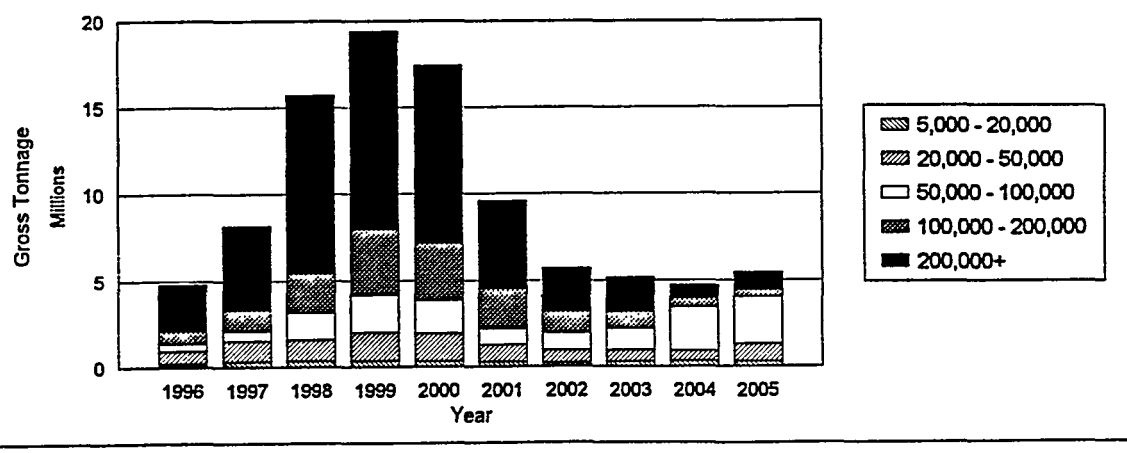


Figure 8.5c : FUTURE HIGH CASE DEMAND - TANKER



[spfa164c 27-Mar-1995]

Figure 8.5d : FUTURE LOW CASE DEMAND - TANKER

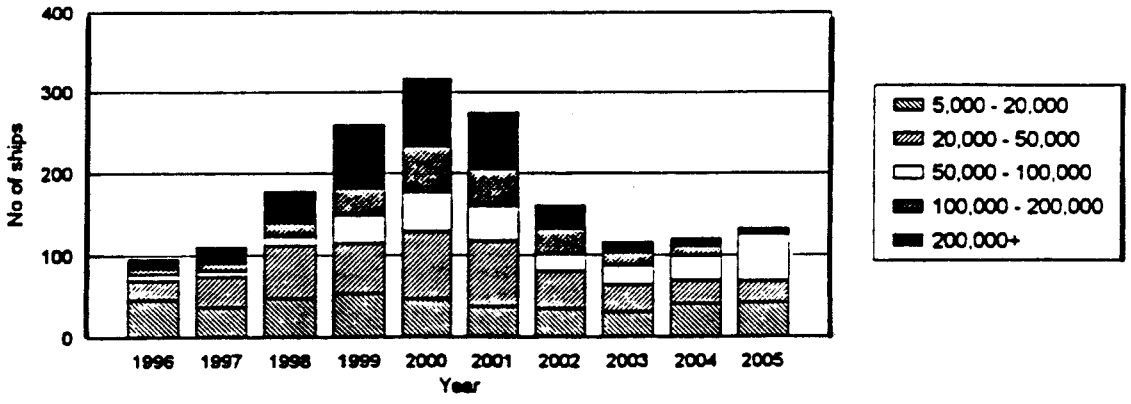


Figure 8.5e : FUTURE BASE CASE DEMAND - TANKER

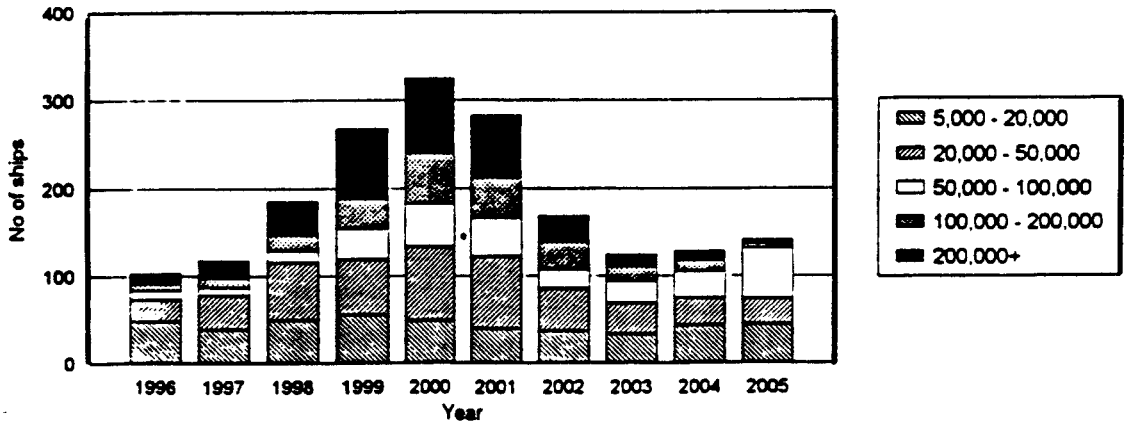
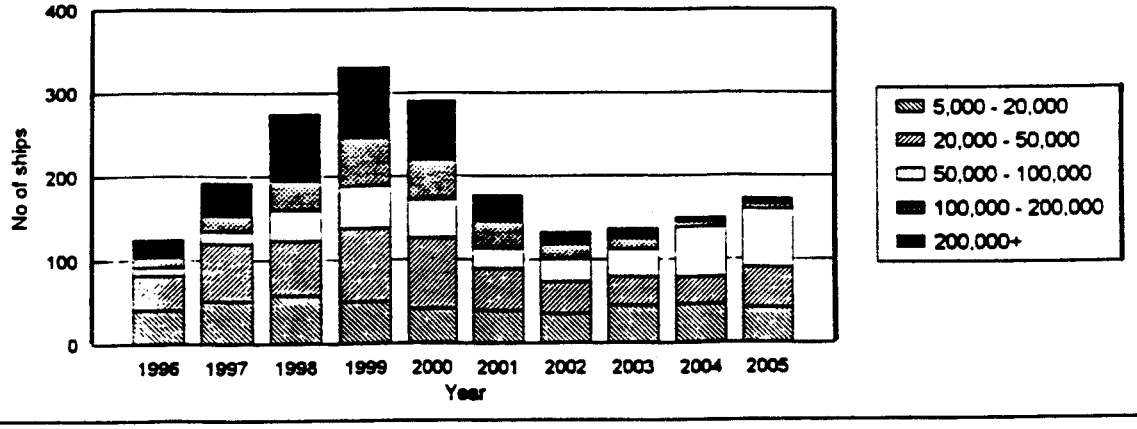


Figure 8.5f : FUTURE HIGH CASE DEMAND - TANKER



[spfa164c 27-Mar-1995]

Table 8.2

FORECAST DEMAND CHARACTERISTICS - TANKER

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-20,000	42	44	45	266,956	280,375	292,544
20,000-50,000	49	51	55	905,680	953,027	1,045,402
50,000-100,000	27	29	37	1,139,955	1,215,156	1,520,659
100,000-200,000	23	24	24	1,574,414	1,631,934	1,671,218
200,000+	36	37	37	4,643,018	4,991,902	5,075,102
Total	177	185	199	8,730,024	9,072,394	9,604,926

8.2.2 Chemical Tankers

Figures 8.6a to 8.6f and Table 8.3 describe the three demand scenarios for chemical tankers over the forecast period. The following key characteristics should be noted.

- Demand is forecast to be fairly steady across the whole forecast periods, and with demand starting to build up again at the end of the period.

- The greatest opportunities for orders occur in the two size bands below 10,000 dwt and between 20,000 and 50,000 dwt.

- Demand in the other sectors os fairly low. Although the gross tonnage represented by very large ships above 50,000 dwt is significant the expected number of contracts is very low (five per year on average in the base case).

Figure 8.6a :FUTURE LOW CASE DEMAND - CH TANKER

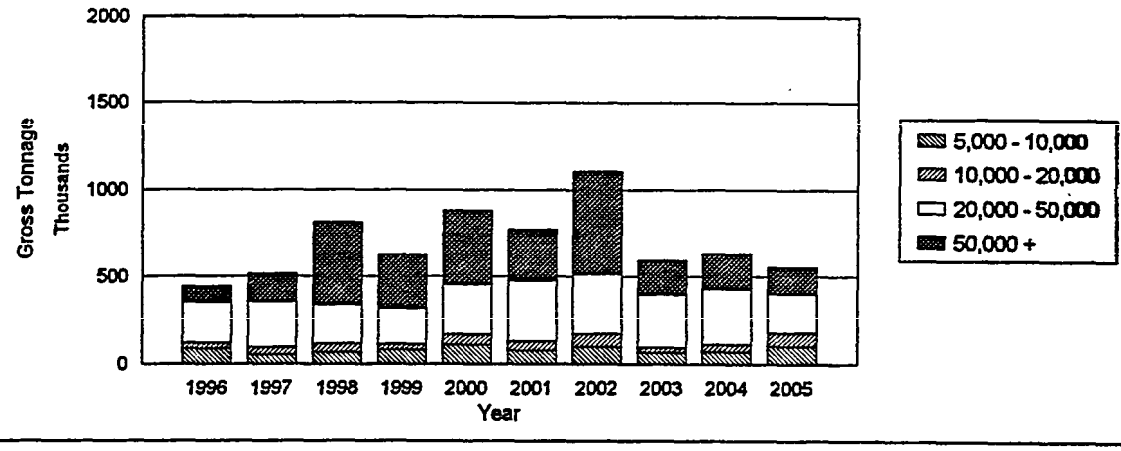


Figure 8.6b : FUTURE BASE CASE DEMAND - CH TANKER

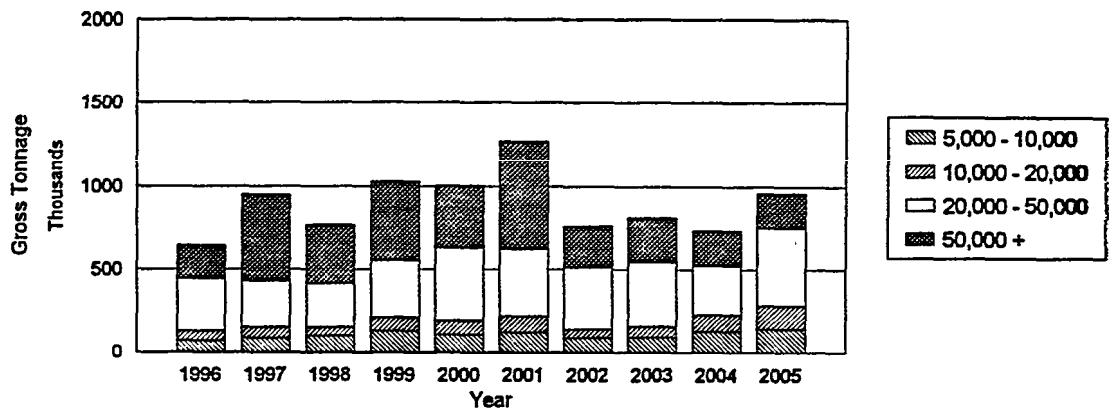
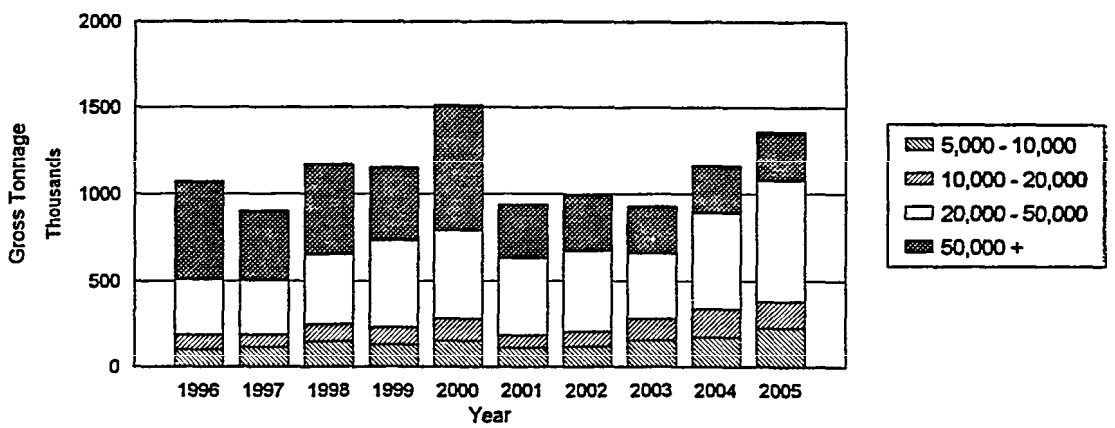


Figure 8.6c : FUTURE HIGH CASE DEMAND - CH TANKER



[spfa165c 27-Mar-1995]

Figure 8.6d : FUTURE LOW CASE DEMAND - CH TANKER

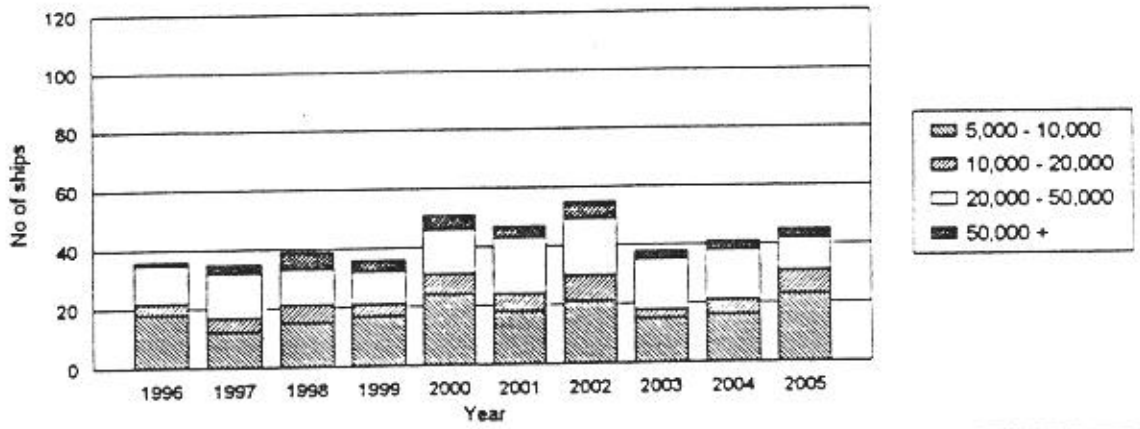


Figure 8.6e : FUTURE BASE CASE DEMAND - CH TANKER

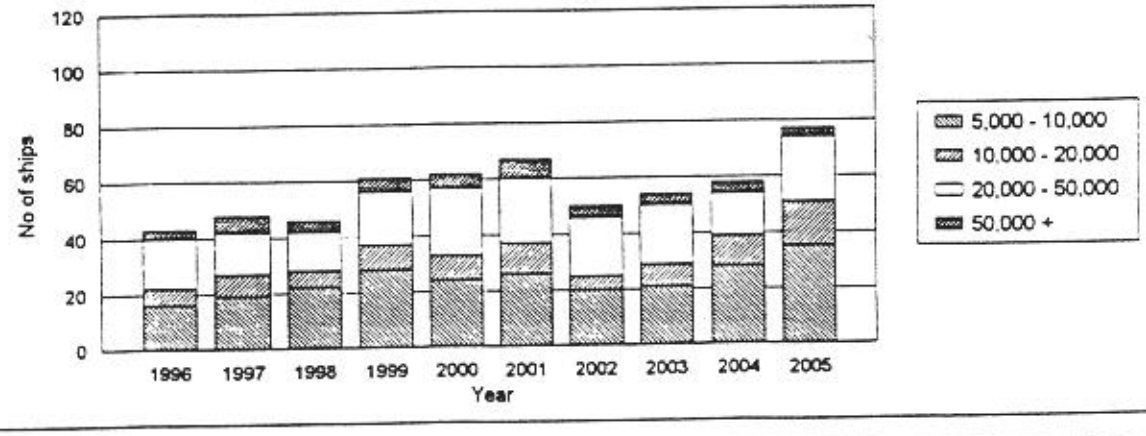
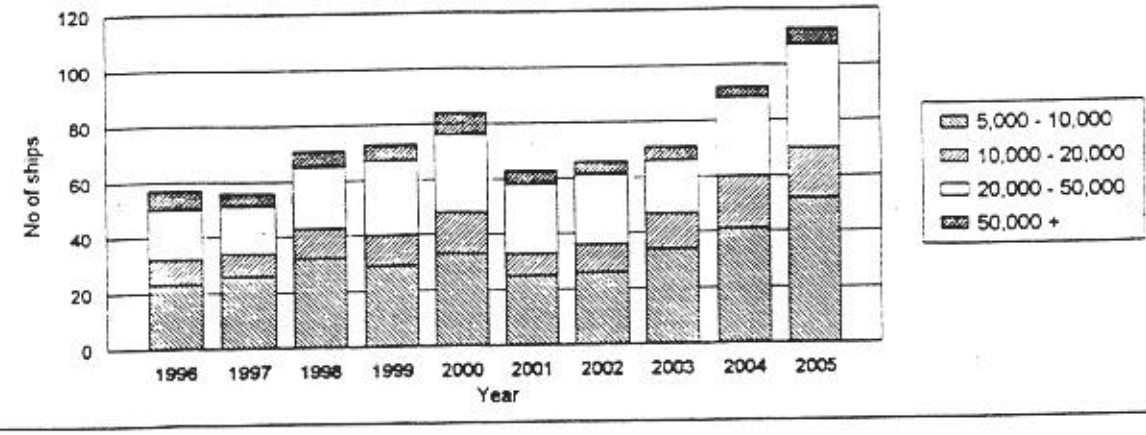


Figure 8.6f : FUTURE HIGH CASE DEMAND - CH TANKER



[spfa165c 27-Mar-1995]

Table 8.3

FORECAST DEMAND CHARACTERISTICS - CHEMICAL TANKER

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-I0,000	18	24	32	80,456	105,496	141,042
10,000-20,000	6	9	12	49,519	78,184	106,768
20,000-50,000	15	19	25	272,266	359,440	463,479
50,000+	4	5	6	289,245	349,506	408,033
Total	42	57	75	691,485	892,626	1,I19,321

8.2.3 Bulk Carriers

Figures 8.7a to 8.7f and Table 8.4 describe the forecast demand for bulk carriers for the three scenarios. The following main characteristics should be noted:

- The demand forecast is, perhaps unexpectedly, significantly less peaked than seen in the tanker sector, and in the base and high cases, builds up towards the end of the forecast period, following a lull at the start of the next decade.

- The sector is dominated by the handysize range, or as is now developing ‘handymax’’ ships of up to 45,000 dwt. These are expected to remain as the’workhorse’ of the bulk carrier trades.

- Demand for panamax and small bulk carriers, below 20,000 dwt, is very much lower than the handymax sectors, although showing a steady level of demand. The markets for cape size and VLBC tonnage are small, and these should be regarded as niche sectors.

Figure 8.7a : FUTURE LOW CASE DEMAND - BULKER

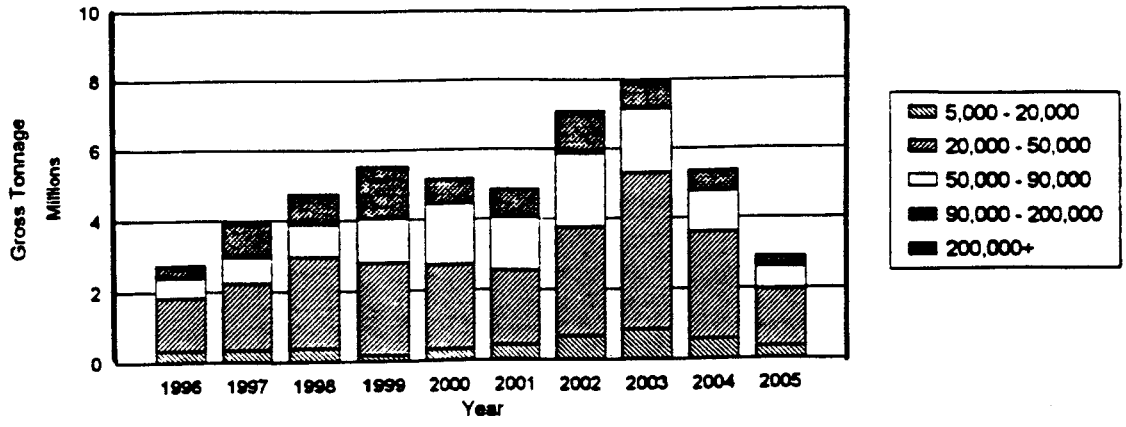


Figure 8.7b : FUTURE BASE CASE DEMAND - BULKER

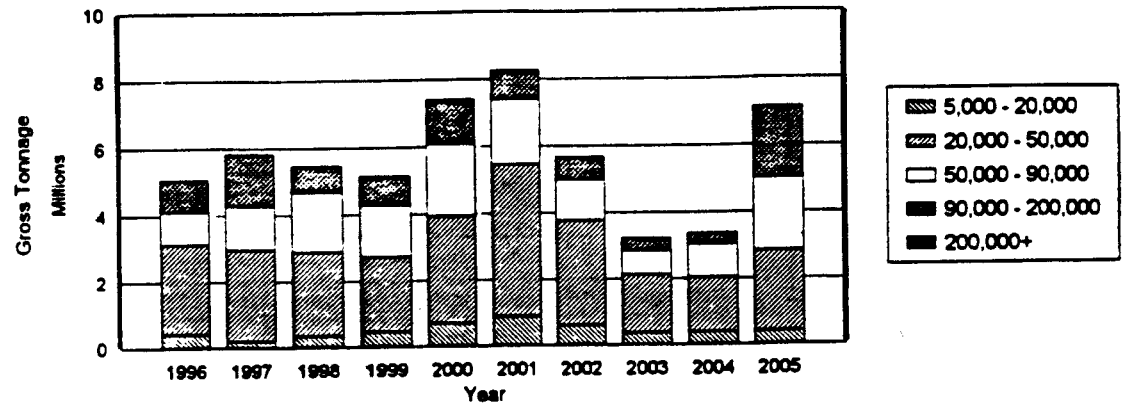
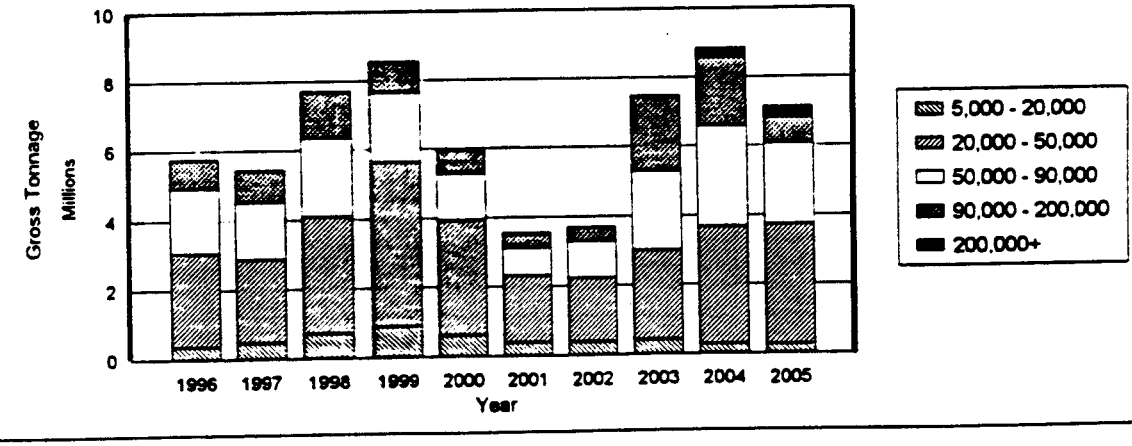


Figure 8.7c : FUTURE HIGH CASE DEMAND - BULKER



[spfa166c 11-May-1995]

Figure 8.7d : FUTURE LOW CASE DEMAND - BULKER

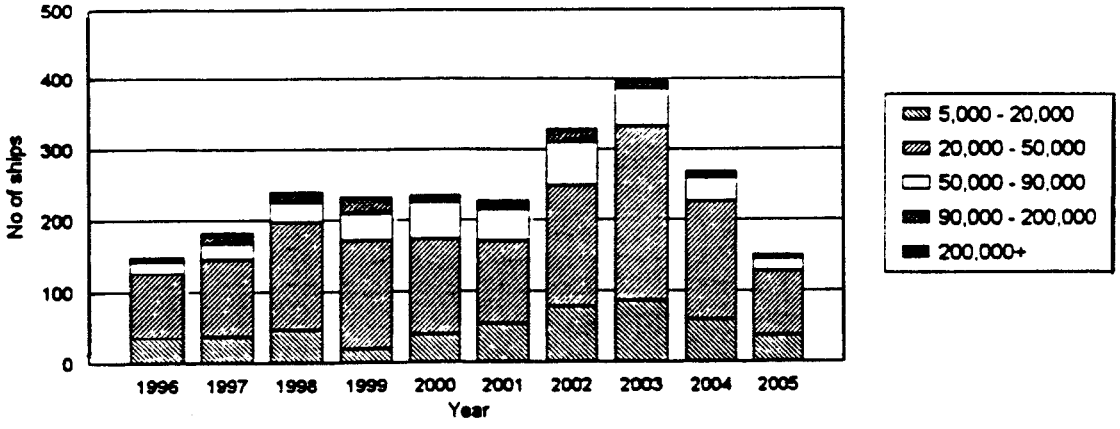


Figure 8.8e : FUTURE BASE CASE DEMAND - BULKER

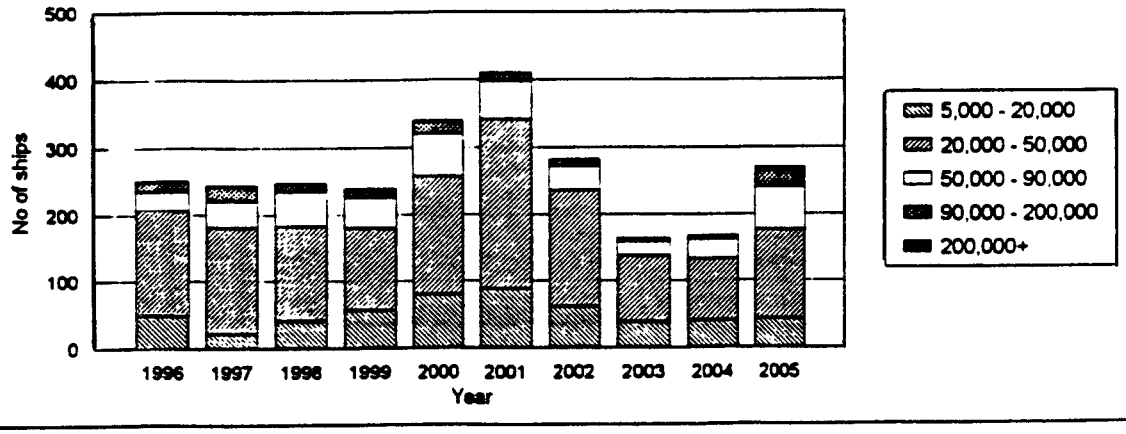
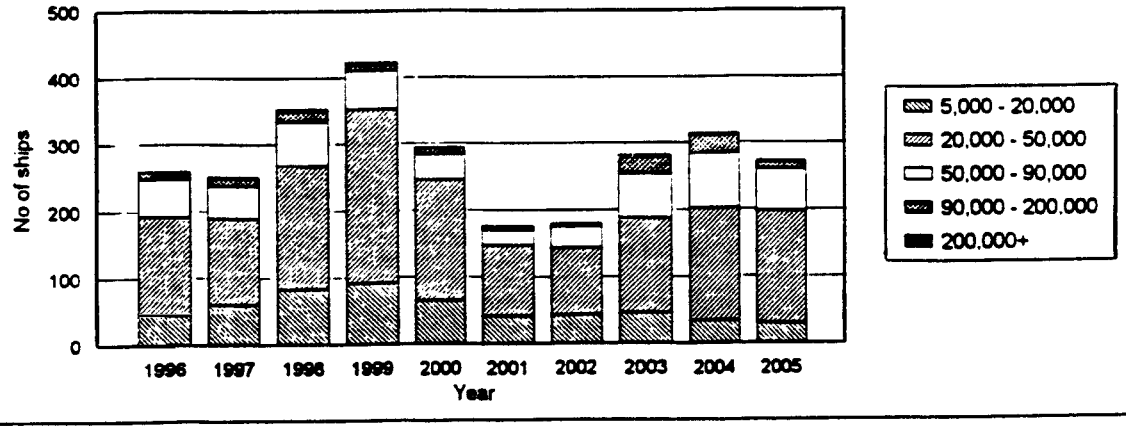


Figure 8.7f : FUTURE HIGH CASE DEMAND - BULKER



[spfa166c 11-May-1995]

Table 8.4

FORECAST DEMAND CHARACTERISTICS - BULK CARRIER

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-20,000	50	52	54	446,381	472,478	484,456
20,000-50,000	143	151	159	2,543,025	2,727,610	2,975,853
50,000-90,000	36	43	52	1,220,402	1,470,967	1,826,503
90,000-200,000	13	15	15	814,249	972,486	1,042,235
200,000+	o	0	1	8,544	17,281	87,368
Total	241	261	281	5,032,580	5,660,822	6,416,414

8.2.4 OBO

Figures 8.8a and Table 8.5 present the details of demand scenarios for OBOs. The following key points should be noted:

- The level of volume forecast is low, and strategically it is likely to be necessary to combine OBO construction as an option with building conventional bulk carriers or tankers.

- The peak of demand occurs in the first half of the forecast period, driven by the replacement demand for cape size tonnage. Demand for panamax ships then picks up at the dominant feature in the second half of the period. Demand outside these two size ranges is almost negligible.

Figure 8.8a : FUTURE LOW CASE DEMAND - OBO

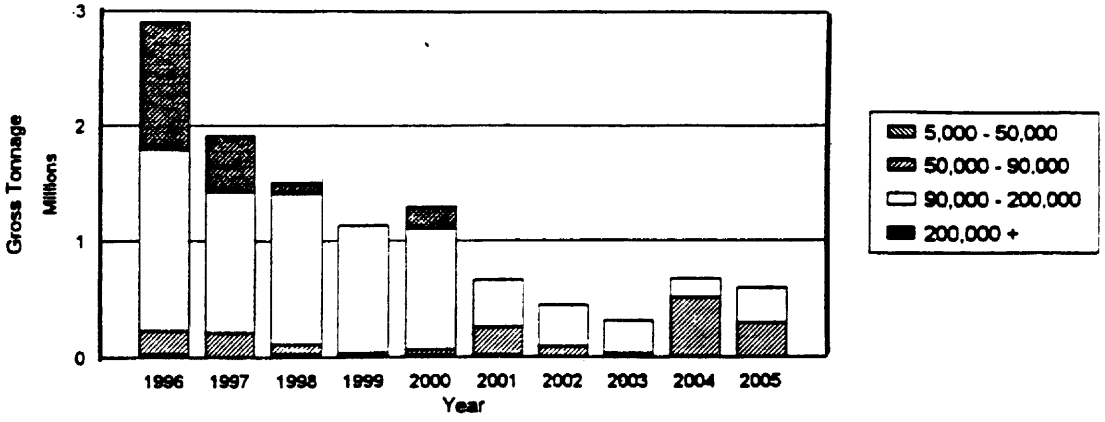


Figure 8.8b : FUTURE BASE CASE DEMAND - OBO

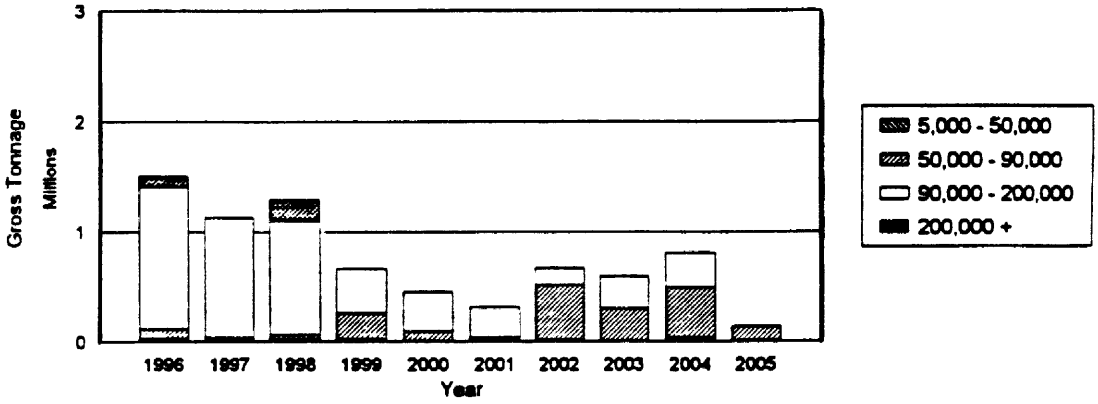
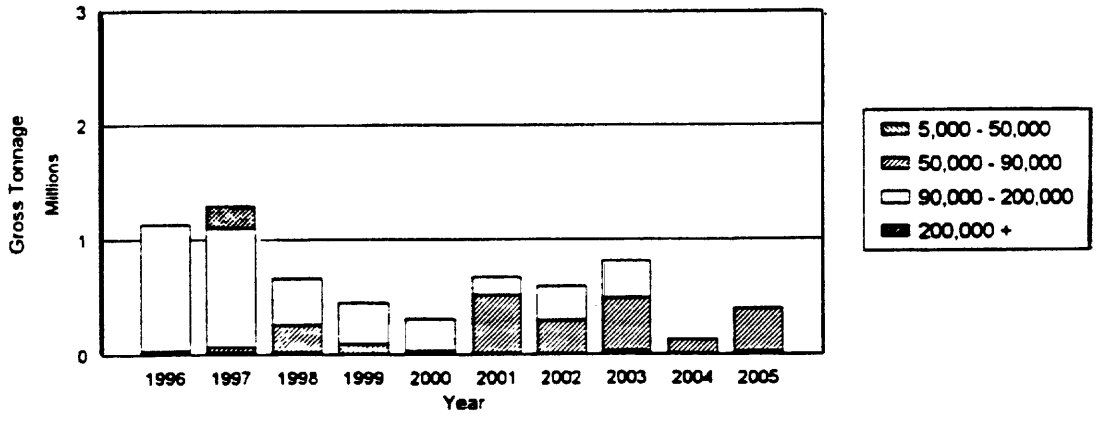


Figure 8.8c : FUTURE HIGH CASE DEMAND - OBO



[spfa167c 11-May-1995]

Figure 8.8d : FUTURE LOW CASE DEMAND - OBO

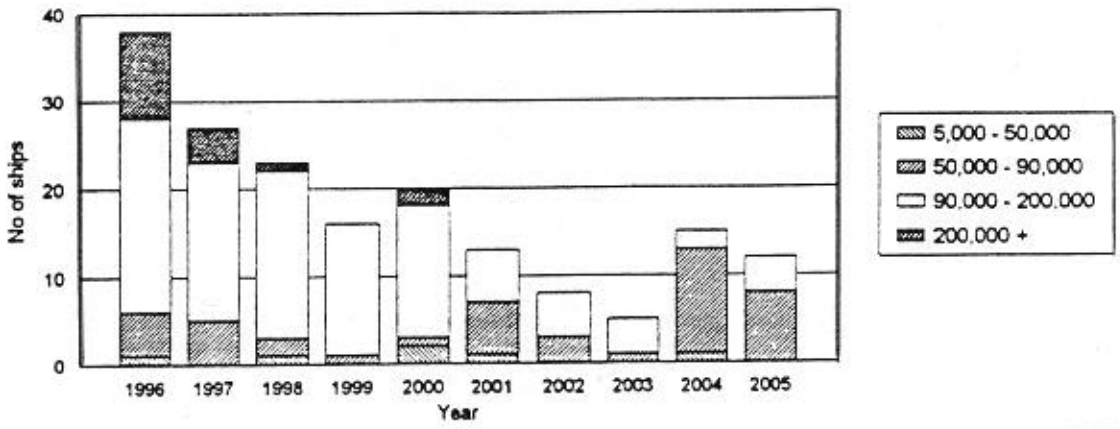


Figure 8.8e : FUTURE BASE CASE DEMAND - OBO

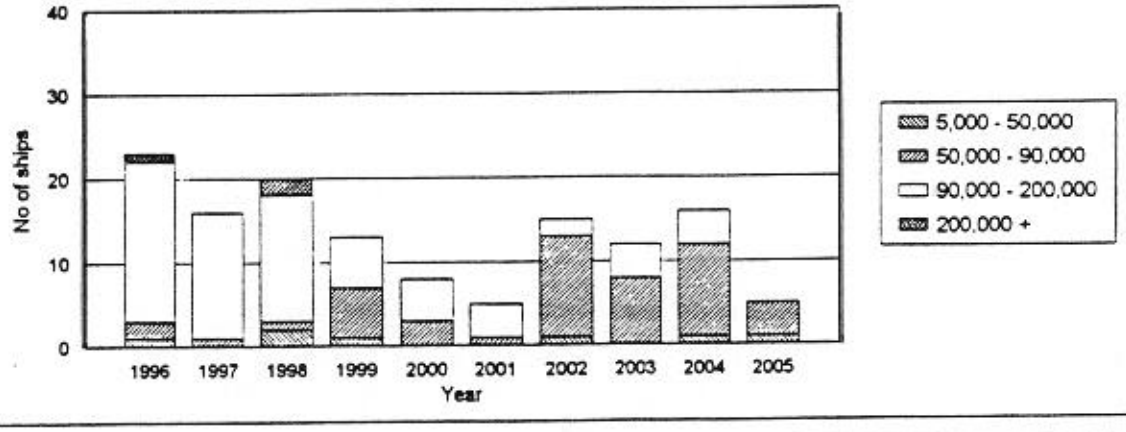
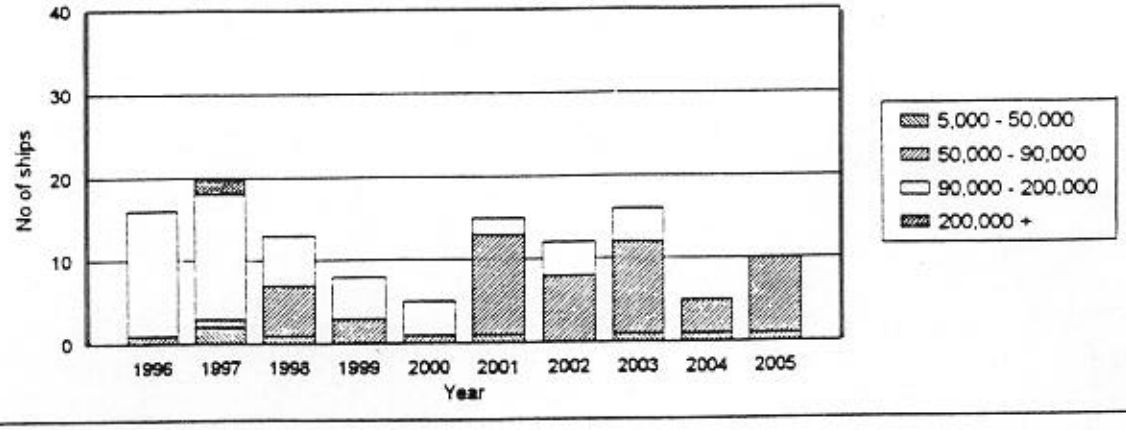


Figure 8.8f : FUTURE HIGH CASE DEMAND - OBO



[spfa167c 11-May-1995]

Table 8.5

FORECAST DEMAND CHARACTERISTICS - OBO

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-50,000	1	1	1	10,877	11,552	11,214
50,000-90,000	4	5	6	176,681	194,325	223,884
90,000-200,000	11	7	6	767,223	522,729	392,932
200,000+	2	0	0	190,624	29,552	19,747
Total	18	13	12	1,145,404	758,158	647,777

8.2.5 General Cargo

Figures 8.9a and Table 8.6 present details of the forecast level of demand for generic cargo ships. The following key points should be noted:

- Demand for general cargo tonnage peaks in the second half of the forecast period.

- A reasonably steady level of demand is forecast for the smaller sectors below 20,000 dwt.

- For the larger size band, above 20,000 dwt, demand builds up in the second half of the forecast period, with significantly lower volume than for ships below 20,000. This is consistent with the change in trading patters for this ship type, with an increase in feeder tonnage and short sea trading.

Figure 8.9a : FUTURE LOW CASE DEMAND - GEN CARGO

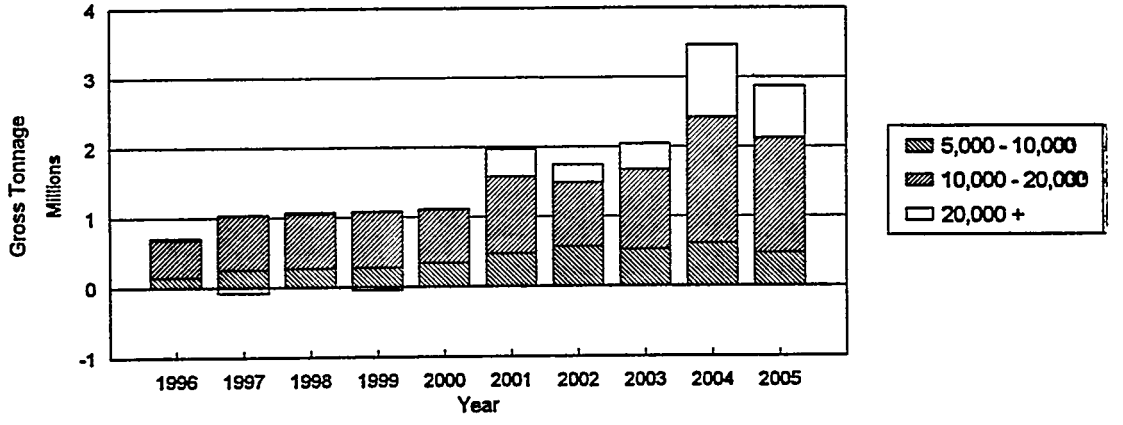


Figure 8.9b : FUTURE BASE CASE DEMAND - GEN CARGO

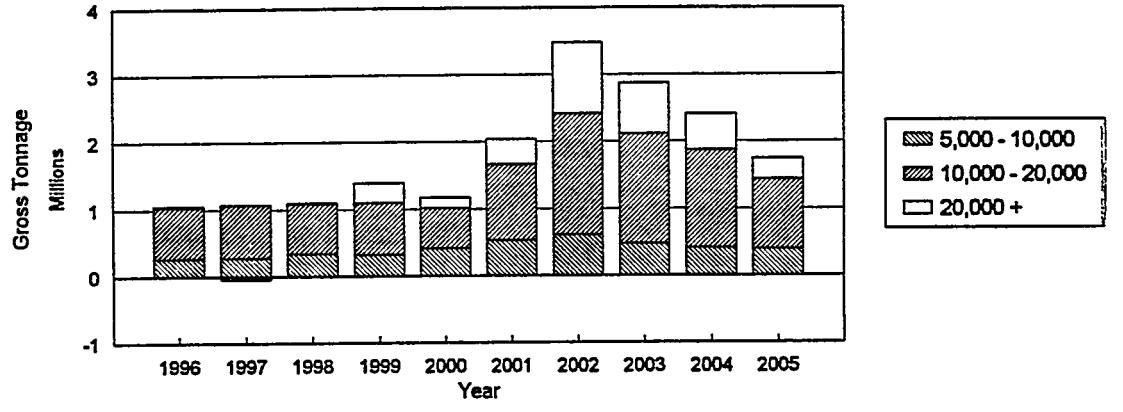


Figure 8.9c : FUTURE HIGH CASE DEMAND - GEN CARGO

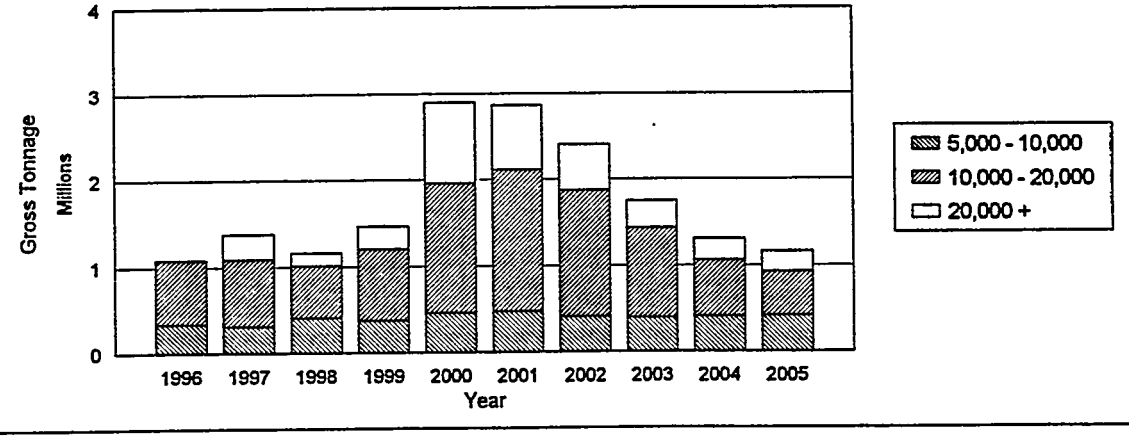


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Figure 8.9d : FUTURE LOW CASE DEMAND - GEN CARGO

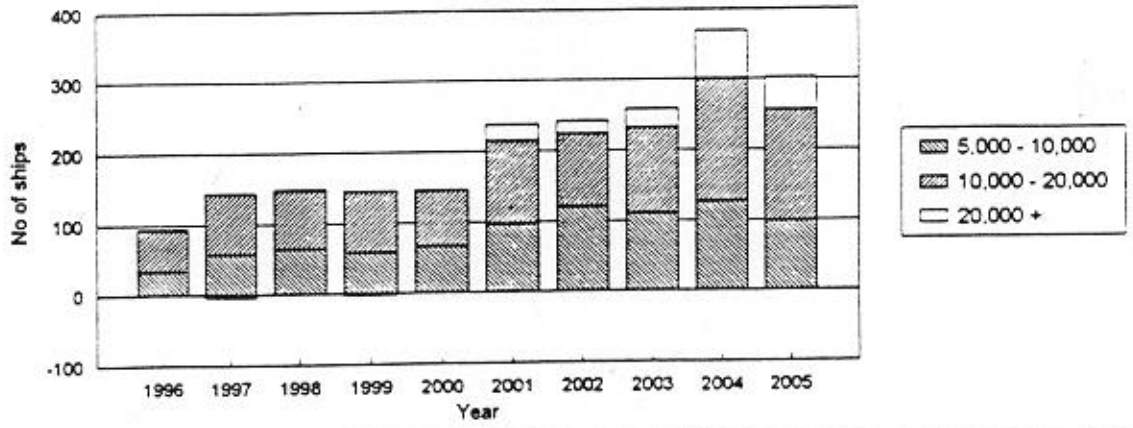


Figure 8.9e : FUTURE BASE CASE DEMAND - GEN CARGO

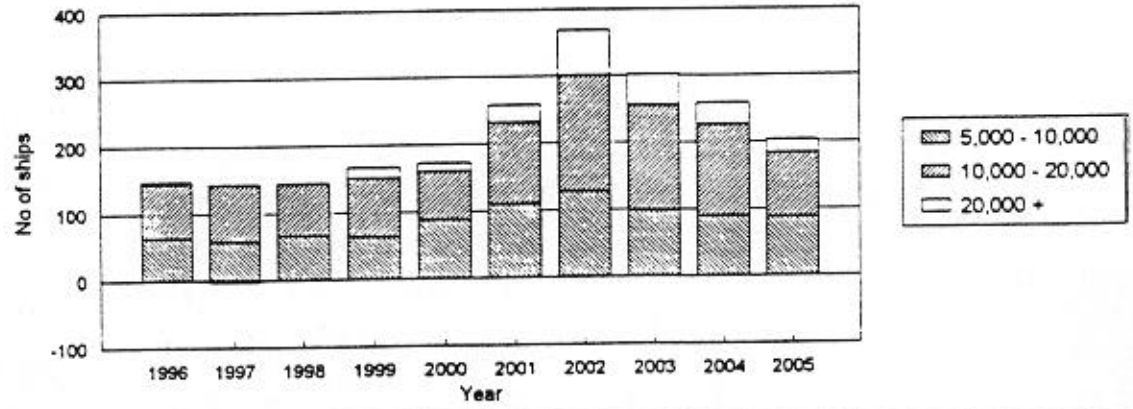
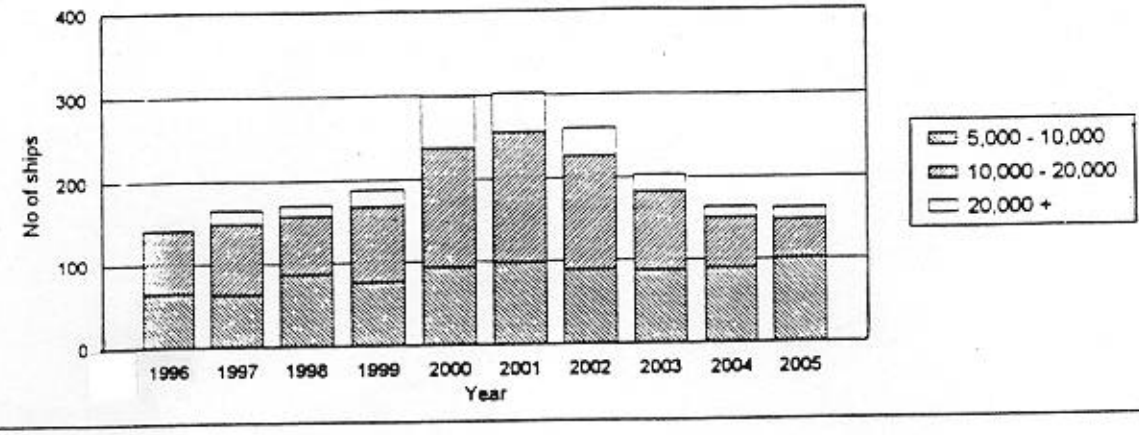


Figure 8.9f : FUTURE HIGH CASE DEMAND - GEN CARGO



[spfa168c 11-May-1995]

Table 8.6

FORECAST DEMAND CHARACTERISTICS - GENERAL CARGO

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-10,000	84	85	85	397,680	405,048	401,139
I0,000-20,000	107	109	97	1,027,184	1,080,490	974,442
20,000+	18	22	24	275,824	343,249	371,427
T o t a l	209	216	206	1,700,688	1,828,787	1,747,008

8.2.6 Container

Figures 8.10a to 8.10f and Table 8.7 describe the future characteristics of the container market. The following key attributes should be noted:

- Demand in the base and high cases is reasonably steady over the whole forecast period, but the low case signals an alarm against over-ordering in this sector. As outlined earlier in this study, the rate of growth of the container fleet is expected to slow over the forecast period. As a pessimistic case, a significant fall in demand could be seen at the start of the next decade. With the high degree of specialization in this sector, this would lead to very difficult market conditions.

- Apart from this, demand is forecast to be fairly steady and even across all sectors.

Figure 8.10a: FUTURE LOW CASE DEMAND - CONTAINER

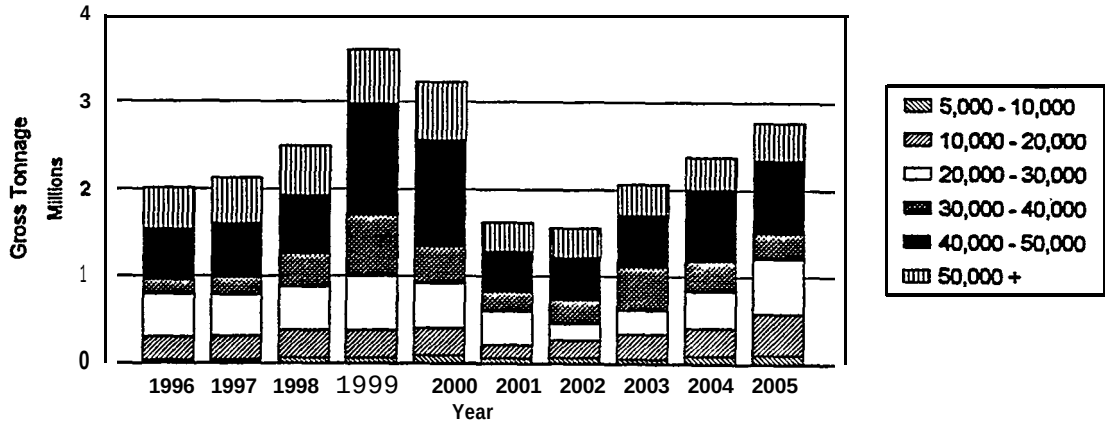


Figure 8.10b: FUTURE BASE CASE DEMAND - CONTAINER

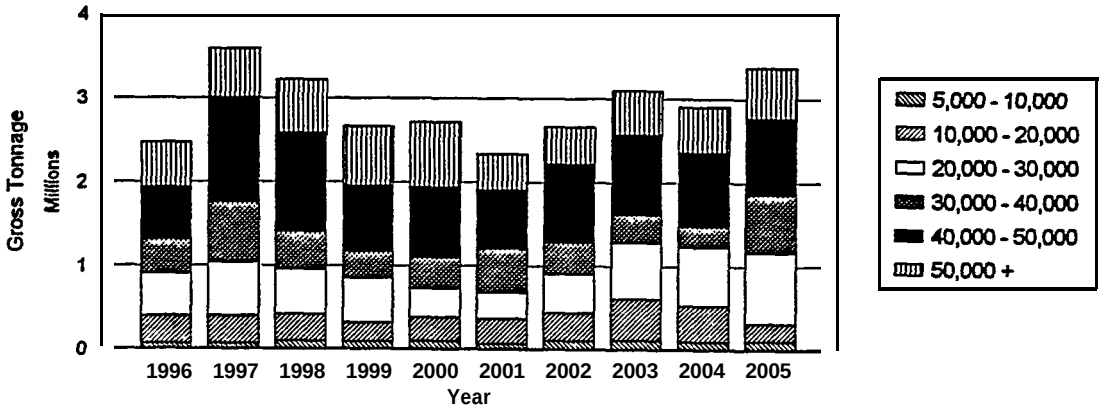
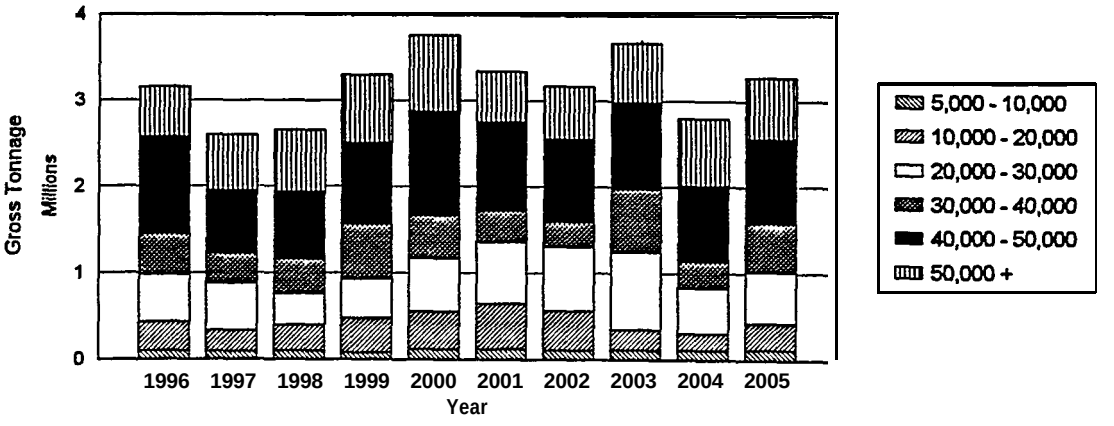


Figure 8.I0C: FUTURE HIGH CASE DEMAND - CONTAINER



[spfa169c 11-May-1995]

Figure 8.10d : FUTURE LOW CASE DEMAND - CONTAINER

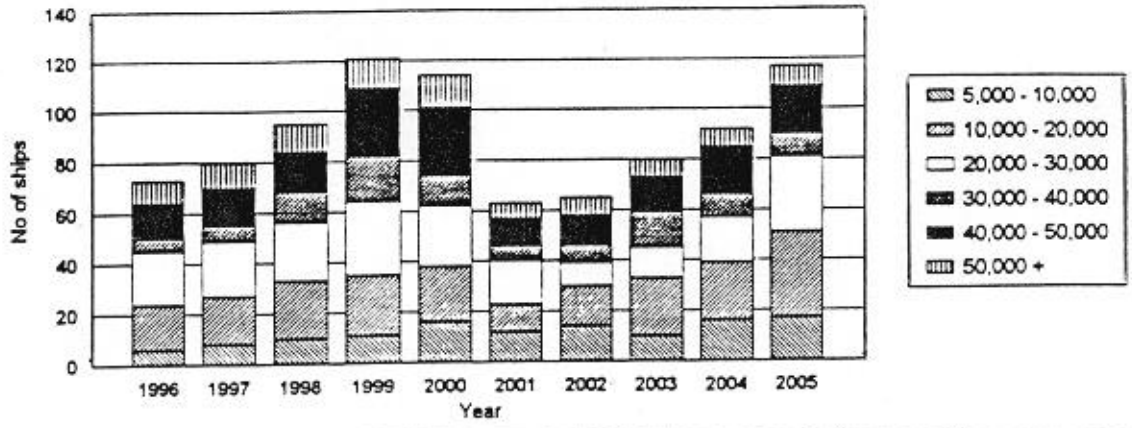


Figure 8.10e : FUTURE BASE CASE DEMAND - CONTAINER

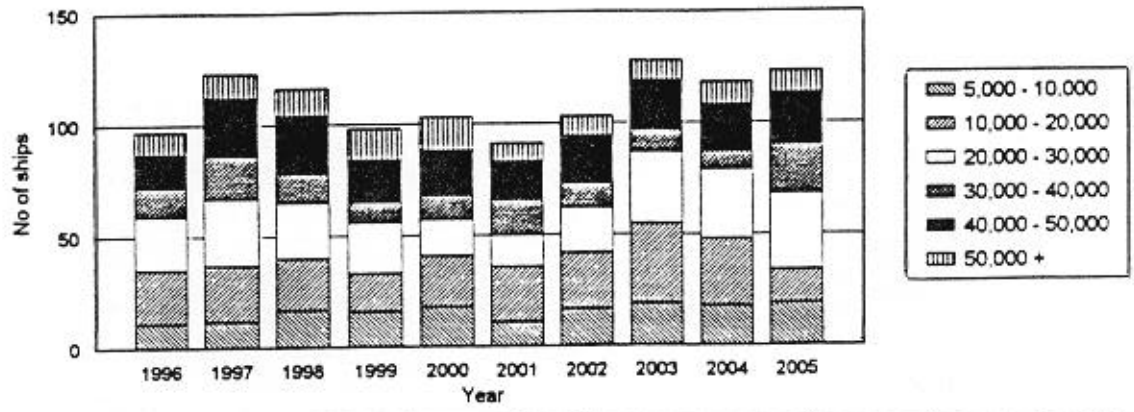
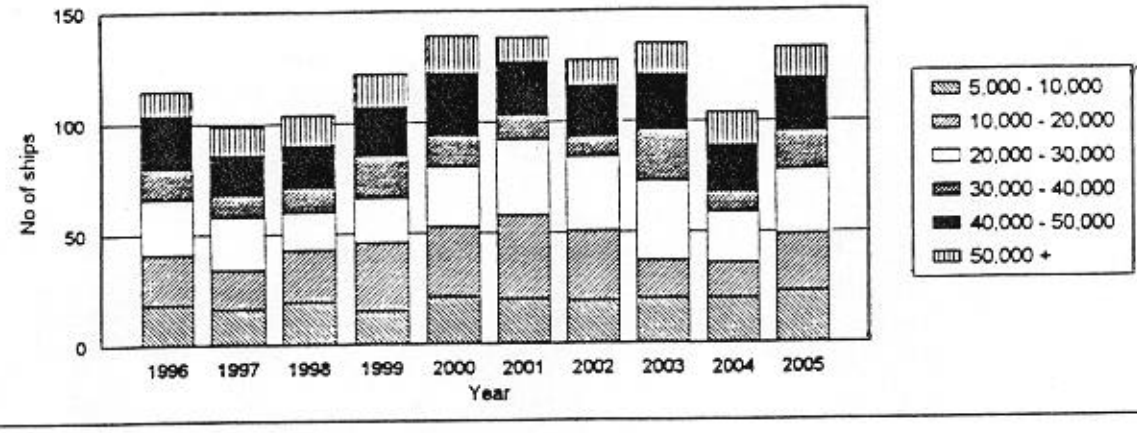


Figure 8.10f :FUTURE HIGH CASE DEMAND - CONTAINER



[spfa169c 11-May-1995]

Table 8.7

FORECAST DEMAND CHARACTERISTICS - CONTAINER SHIP

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-10,000	12	16	19	66.801	87,555	106,045
10,000-20,000	21	24	26	288,678	328,152	339,685
20,000-30,000	21	25	27	448,890	557,375	599,568
30,000-40,000	10	13	14	346,272	444,724	456,854
40,000-50,000	47	21	23	766,625	908,784	968,641
50,000+	9	11	14	464,951	575,612	699,549
Total	90	110	122	2,382,215	2,901,601	3,170,342

8.2.7 Refrigerated Cargo

Figures 8.11a to 8.11f and Table 8.8 present the demand forecast for refrigerated cargo carriers to 2005. The following key points should be noted.

- Demand is forecast to be steady, although building up to a slight peak in the second half of the forecast period.

- Demand for small reefers, under 10,000 dwt, is forecast to be roughly double that for the larger size bands, but in both cases, demand is forecast to be low.

Figure 8.11a : FUTURE LOW CASE DEMAND - REEFER

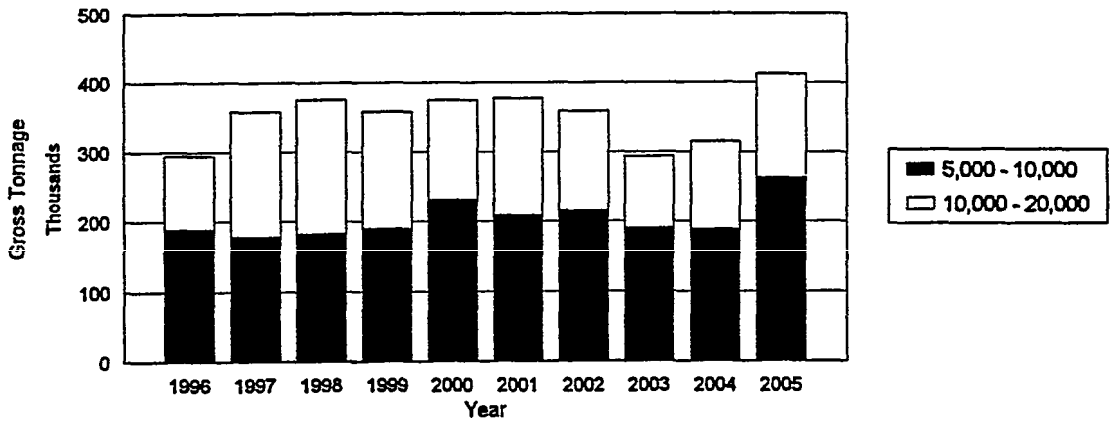


Figure 8.11b : FUTURE BASE CASE DEMAND - REEFER

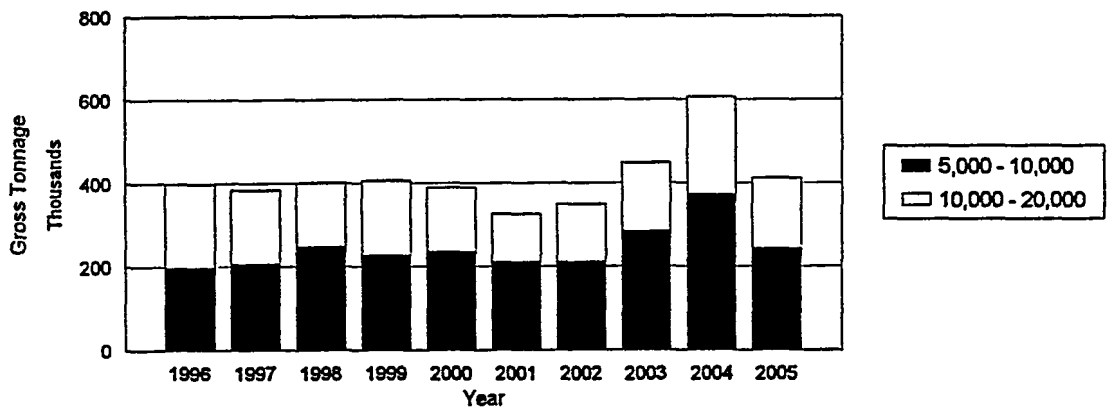
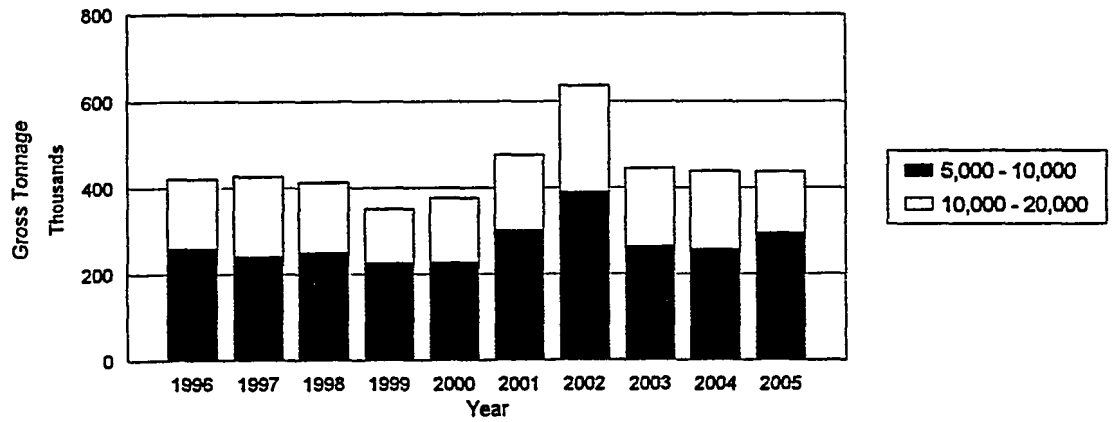


Figure 8.11c : FUTURE HIGH CASE DEMAND - REEFER



[spfa170c 11-May-1995]

Figure 8.11d : FUTURE LOW CASE DEMAND - REEFER

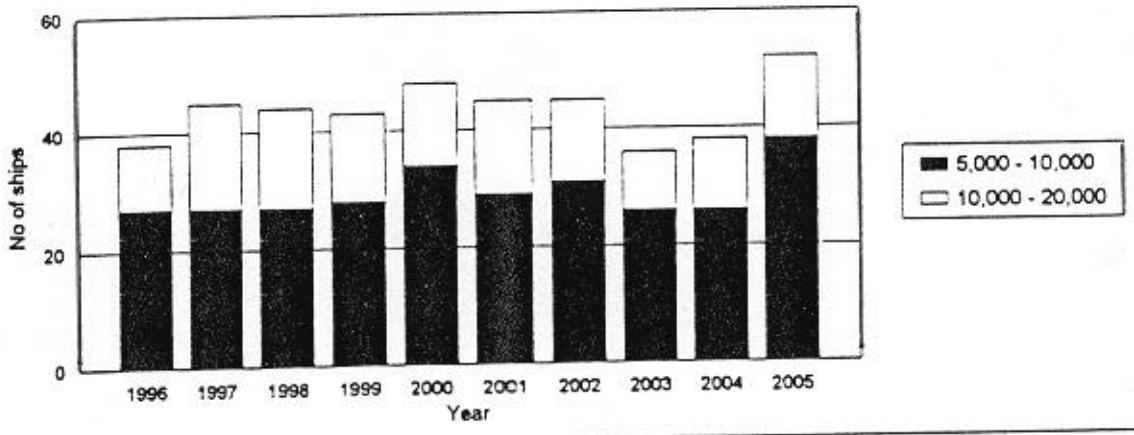


Figure 8.11e : FUTURE BASE CASE DEMAND - REEFER

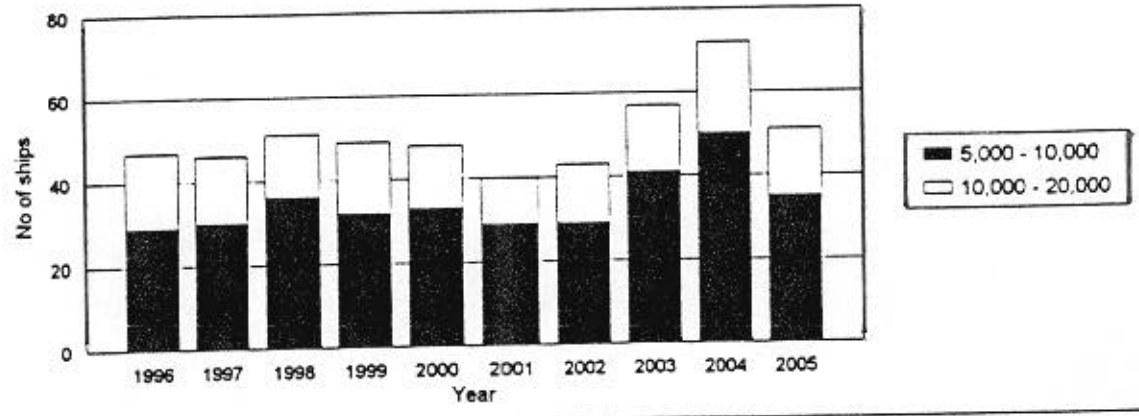
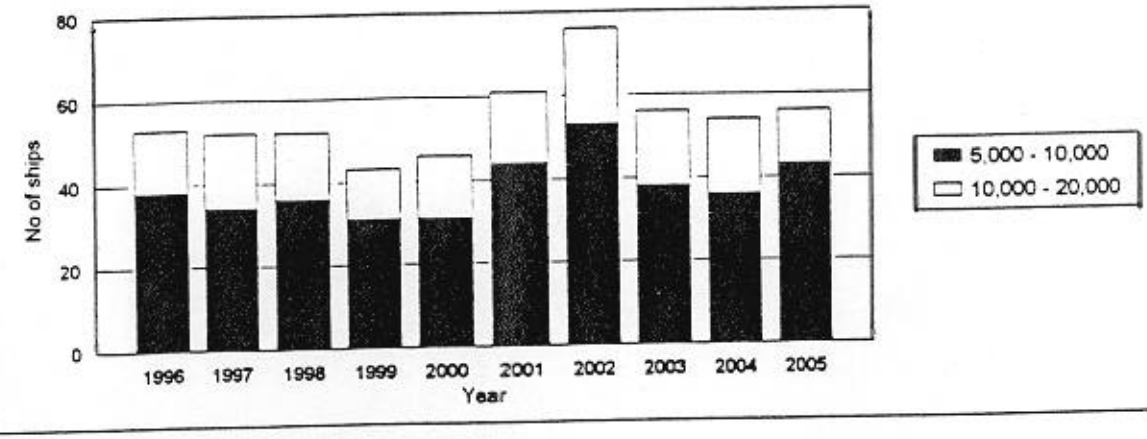


Figure 8.11f : FUTURE HIGH CASE DEMAND - REEFER



[spfa170c 11-May-1995]

Table 8.8

FORECAST DEMAND CHARACTERISTICS - REFRIGERATED CARGO

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-I0,000	29	34	38	203,872	242,760	270,411
10,000-20,000	14	16	17	147,665	168,880	171,996
Total	43	50	55	351,537	411,640	442,407

LPG Carriers

Figures 8.12a to 8.12f and Table 8.9 describe the market for LPG carriers over the forecast period. The following key characteristics should be noted:

- There is forecast to be a peak of demand in the second half of the period, but demand is low, and this is very much a niche sector.

- Demand is forecast to be fairly even across all size bands, although with little demand above 60,000 dwt.

Figure 8.12a : FUTURE LOW CASE DEMAND - LPG

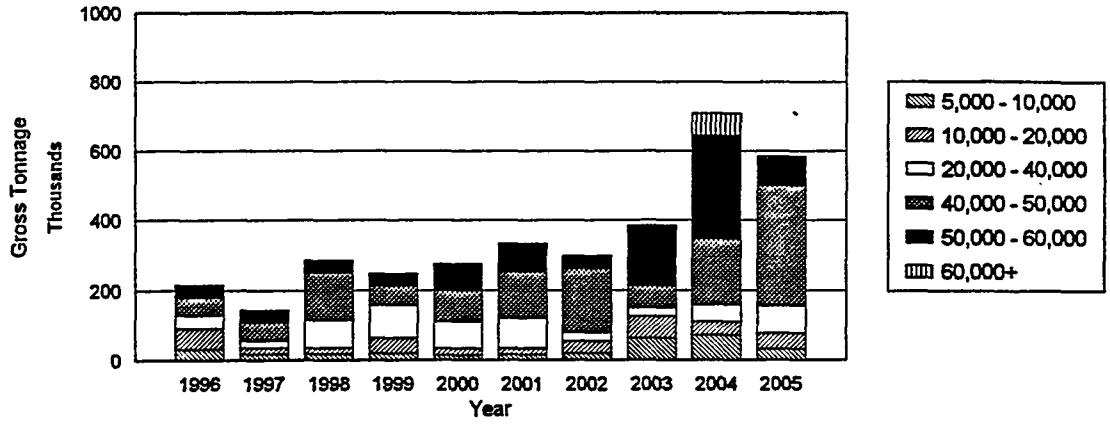


Figure 8.12b : FUTURE BASE CASE DEMAND - LPG

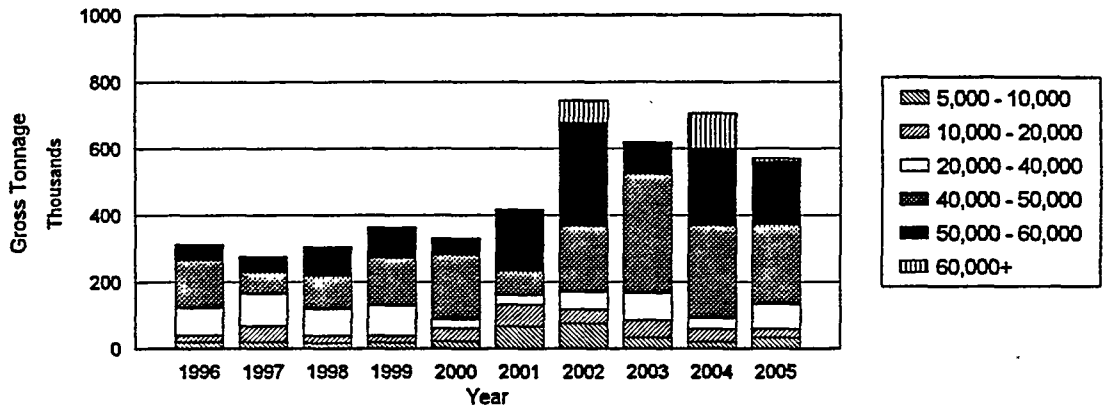
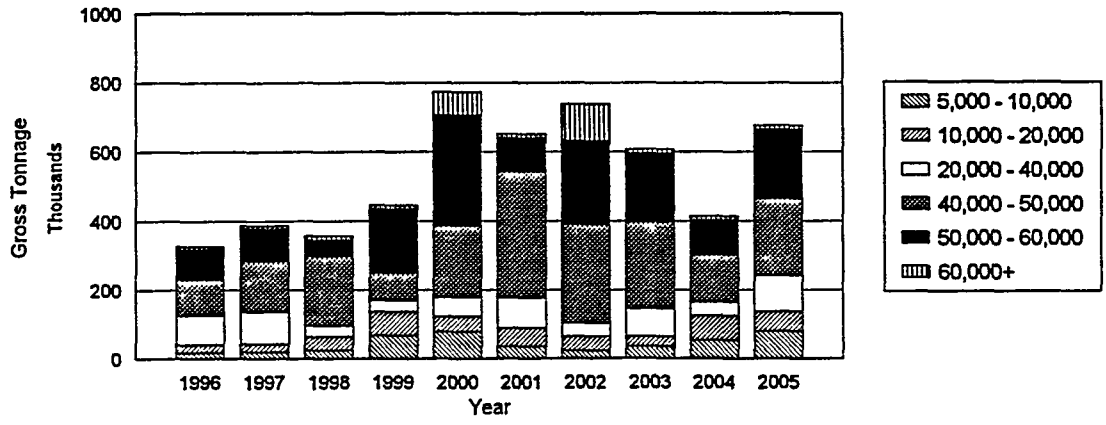


Figure 8.12c : FUTURE HIGH CASE DEMAND - LPG



[spfa171c 11-May-1995]

Figure 8.12d : FUTURE LOW CASE DEMAND - LPG

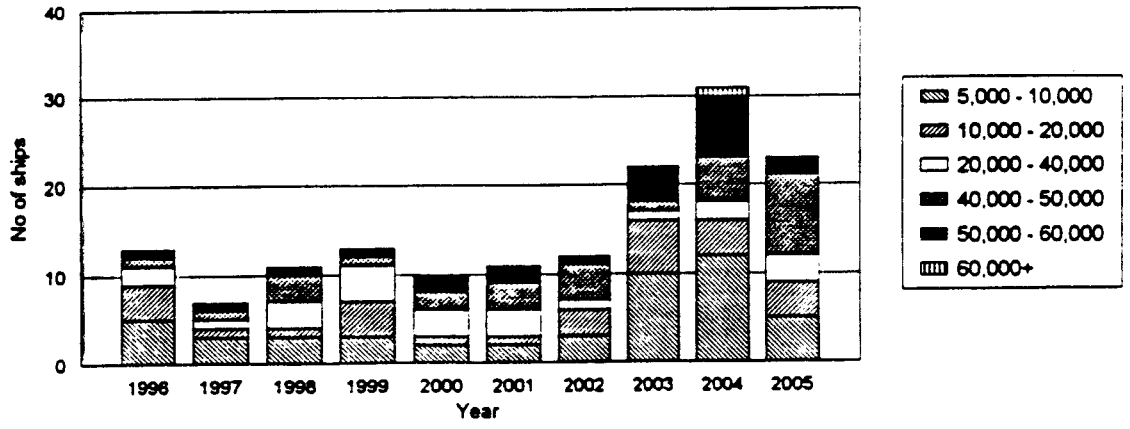


Figure 8.12e : FUTURE BASE CASE DEMAND - LPG

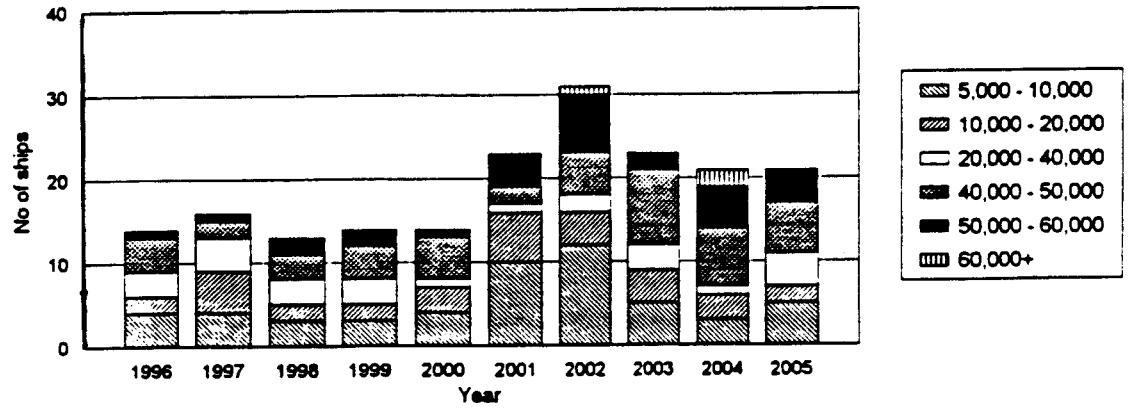
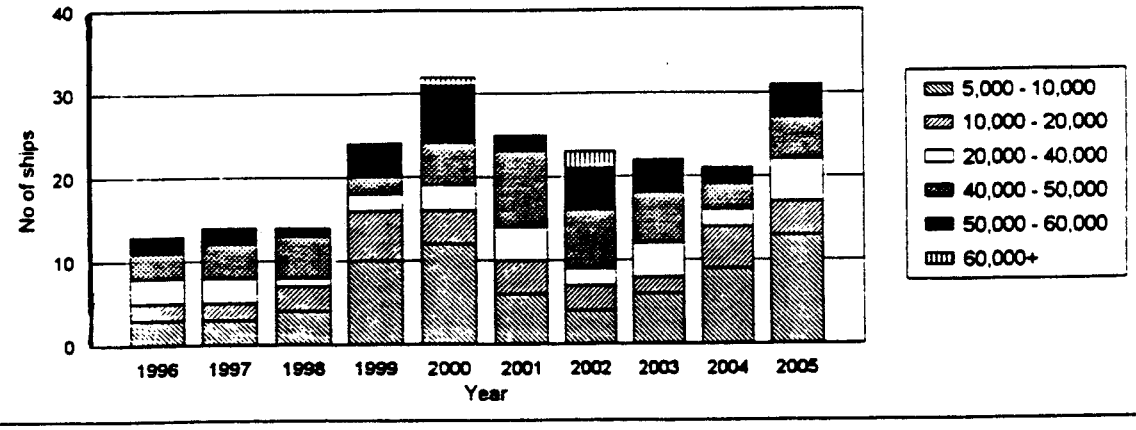


Figure 8.12f : FUTURE HIGH CASE DEMAND - LPG



[spfa171c 11-May-1995]

Table 8.9

FORECAST DEMAND CHARACTERISTICS - LPG GAS CARRIERS

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
5,000-10,000	5	5	7	30,072	32,392	43,262
10,000-20,000	3	3	4	35,492	36,708	45,224
20,000-40,000	2	3	3	58,115	66,010	65,430
40,000-50,000	3	5	5	128,912	177,911	199,853
50,000-60,000	2	3	3	83,930	128,206	158,620
60,000+	1	1	1	11,381	23,006	25,136
Total	16	30	23	347,901	464,234	537,525

8.2.9 LNG Carriers

Figures 8.13a to 8.13f and Table 8.10 present the forecast level of demand for LNG carriers. The following characteristics should be noted:

- As with LPG carriers, demand is forecast to peak somewhat in the second half of the forecast period, although this is very much a niche sector, with low levels of demand (peaking at around 10 deliveries in the highest years).

- The greatest opportunities are seen in the larger size bands, in particular over the peak periods. Little demand is forecast for ships under 60,000 dwt in the second half of the forecast.

Figure 8.13a: FUTURE LOW CASE DEMAND - LNG

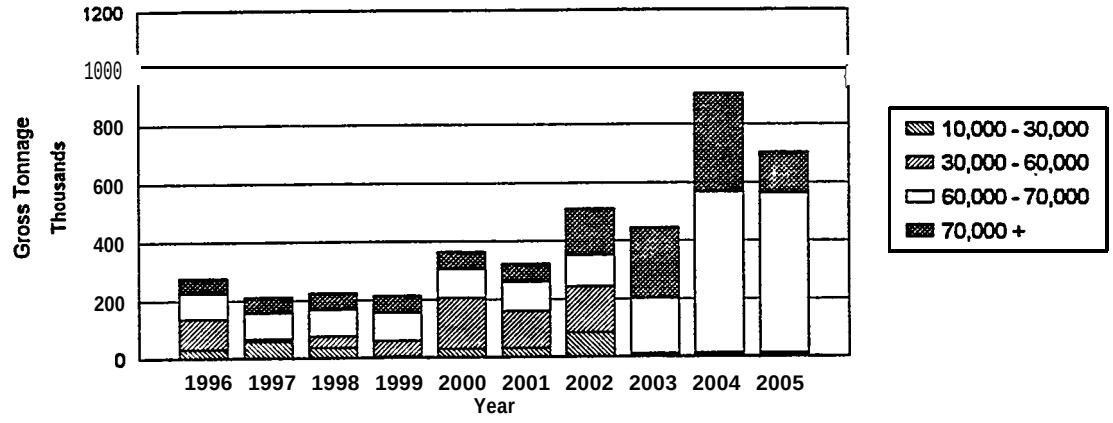


Figure 8.13b : FUTURE BASE CASE DEMAND - LNG

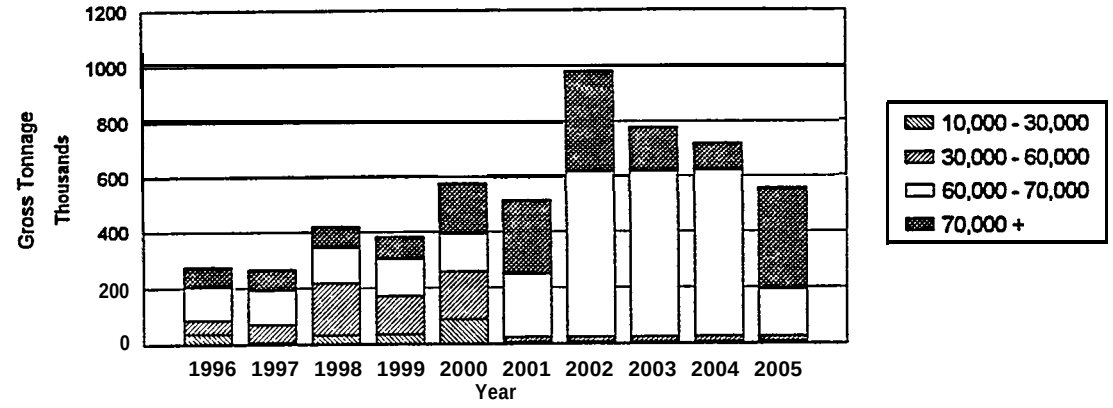


Figure 8.13c: FUTURE HIGH CASE DEMAND - LNG

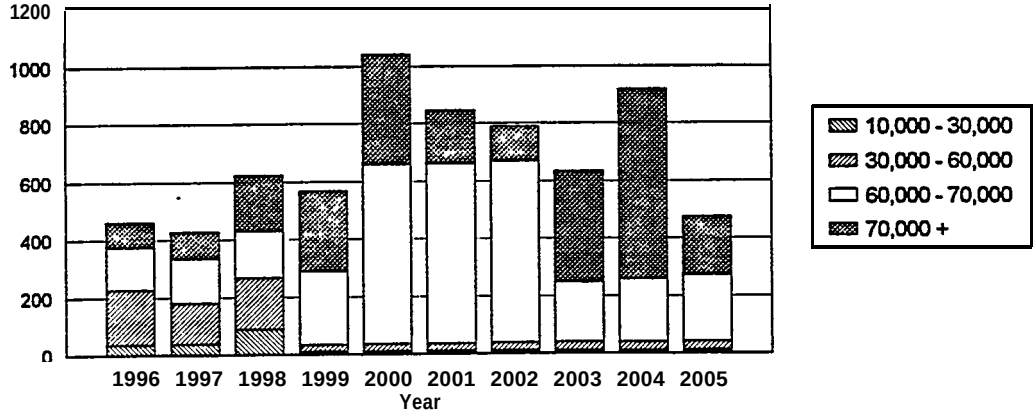


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Figure 8.13d : FUTURE LOW CASE DEMAND - LNG

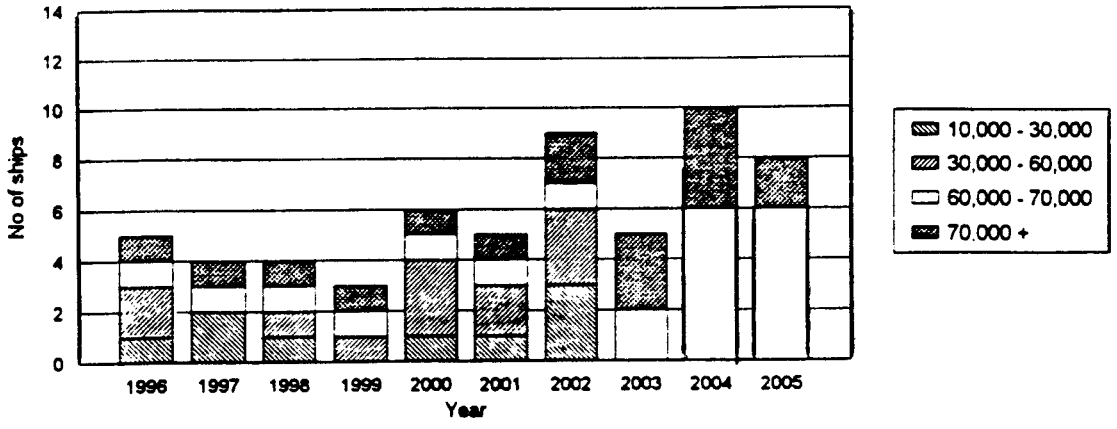


Figure 8.13e : FUTURE BASE CASE DEMAND - LNG

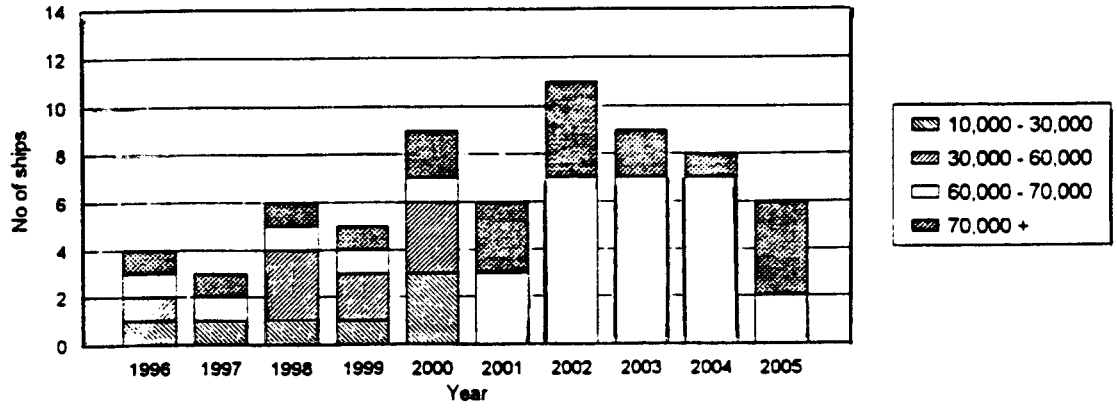
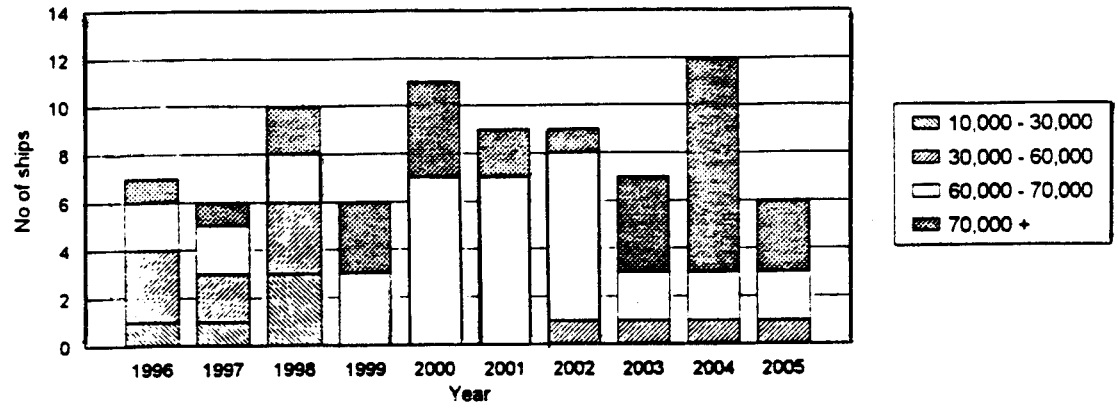


Figure 8.13f : FUTURE HIGH CASE DEMAND - LNG



[spfa172c 11-May-1995]

Table 8.10

FORECAST DEMAND CHARACTERISTICS - LNG GAS CARRIER

Range DWT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
10,000-30,000	1	1	1	28,321	23,305	24,048
30,000-60,000	1	1	1	70,023	68,953	70,237
60,000-70,000	2	3	4	198,117	281,987	326,001
70,000+	2	2	3	122,183	172,434	258,120
Total	6	7	9	418,644	646,679	678,406

8.2.10 Ferries

Figures 8.14a to 8.14f and Table 8.11 present the forecast level of demand for Ferries. The following characteristics should be noted:

- This sector shows probably the greatest degree of uncertainty between the three scenarios. In the low and base cases, demand is shown to build up steadily, but as a high case scenario a considerable peak is seen in the second half of the forecast period, driven by possible ‘grandfathering’ of the ferry fleet following new legislation.

- Demand is greatest in the smaller size ranges, with the ‘super ferry’ category remaining very much a niche sector.

Figure 8.14a : FUTURE LOW CASE DEMAND - FERRY

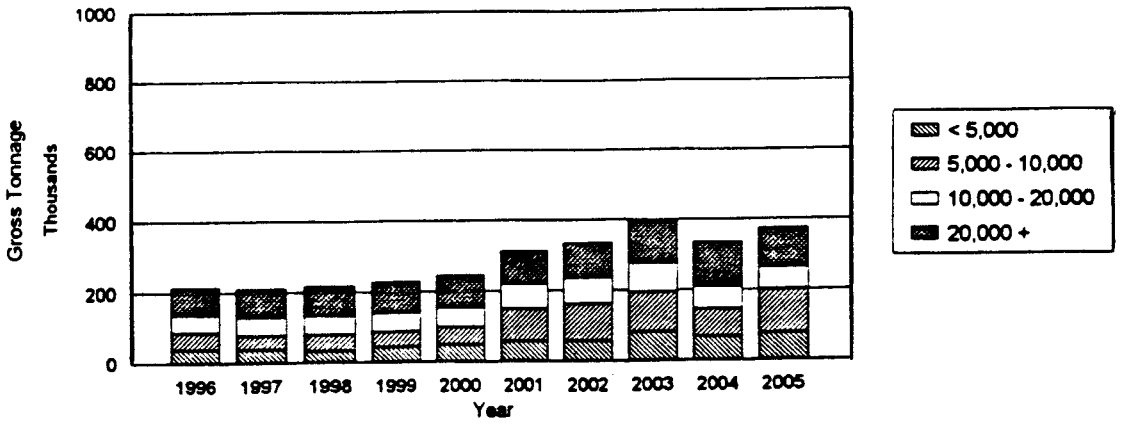


Figure 8.14b : FUTURE BASE CASE DEMAND - FERRY

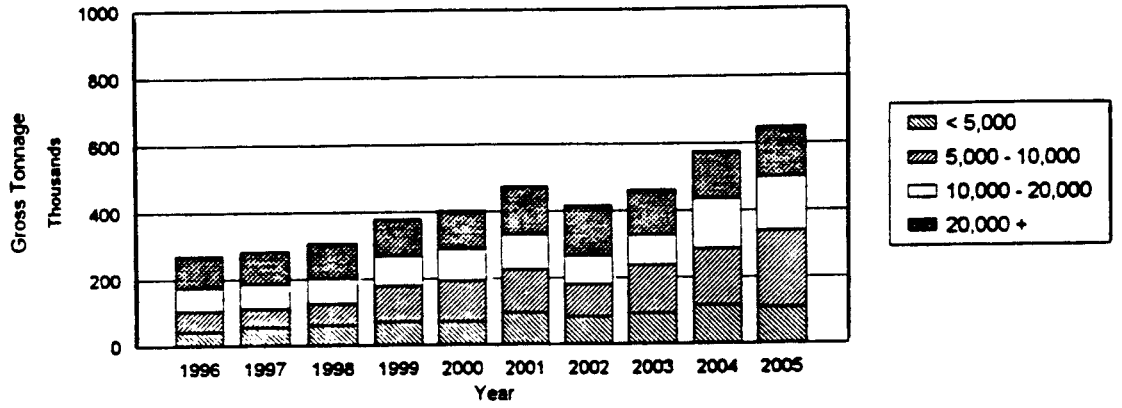


Figure 8.14c : FUTURE HIGH CASE DEMAND - FERRY

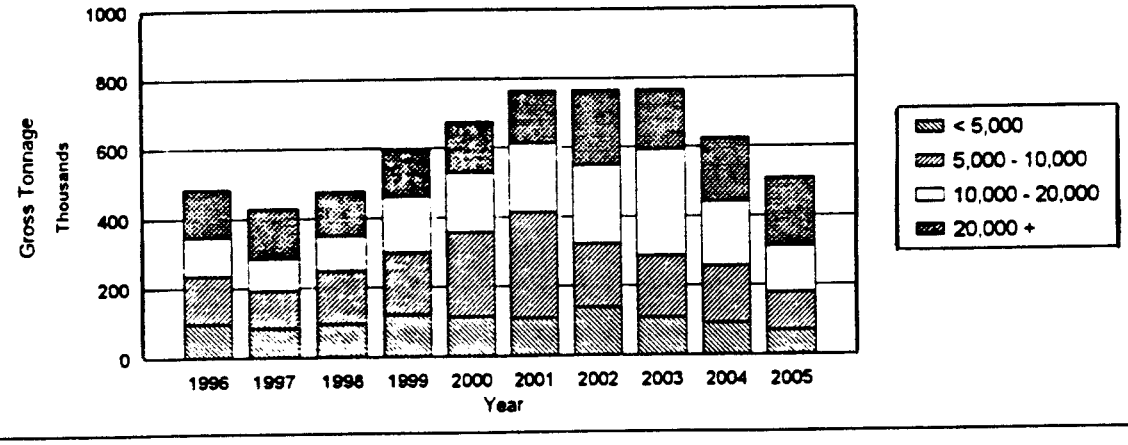


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Figure 8.14d : FUTURE LOW CASE DEMAND - FERRY

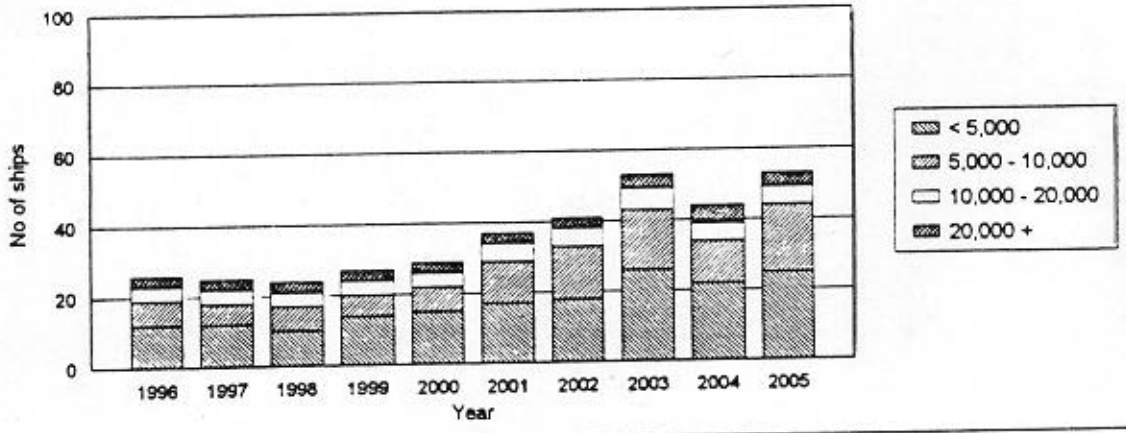


Figure 8.14e : FUTURE BASE CASE DEMAND - FERRY

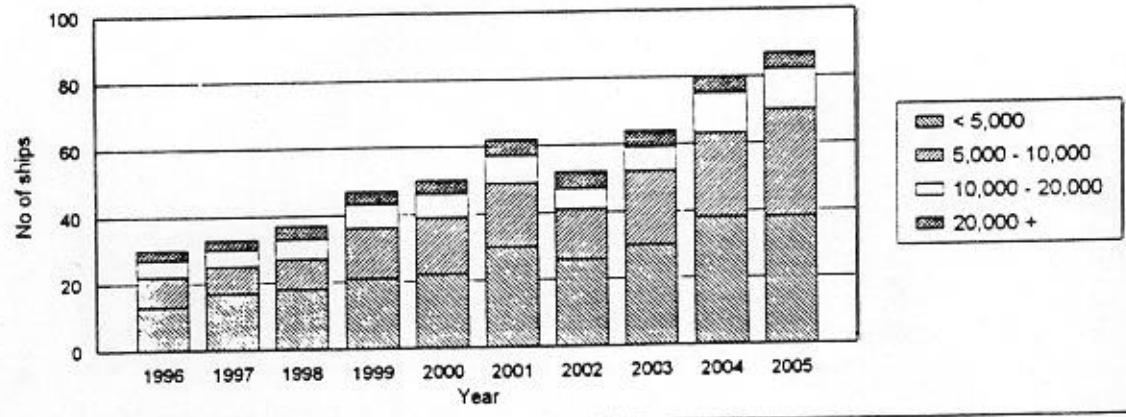
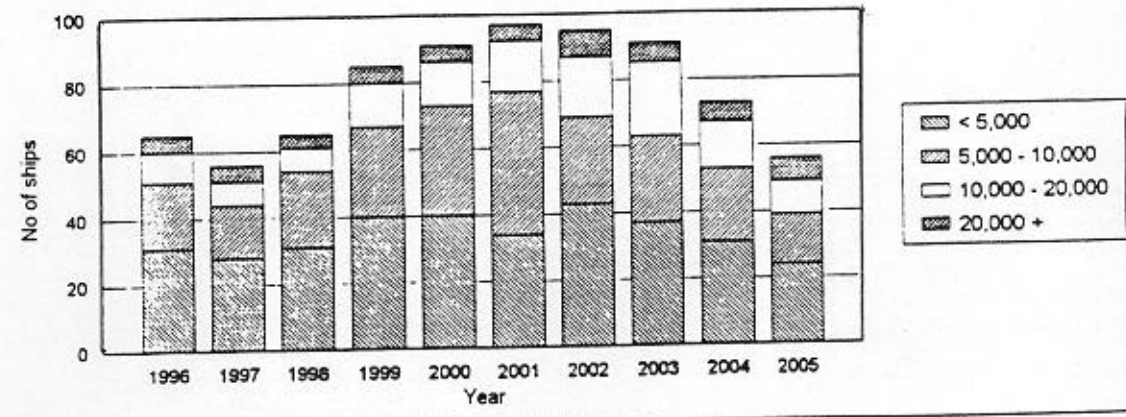


Figure 8.14f : FUTURE HIGH CASE DEMAND - FERRY



[spfa173c 11-May-1995]

Table 8.11

FORECAST DEMAND CHARACTERISTICS - FERRY

Range GT	Average Number par Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
<5,000	17	25	34	54,661	78,550	103,040
5,000-10,000	11	17	25	74,874	120,384	176,140
10,000-20,000	5	8	13	60,447	98,462	167,548
20,000+	3	4	6	96,868	125,532	162,083
Total	36	54	77	286,852	422,928	608,811

8.2.11 Passenger Ships

Figures 8.15a to 8.15f and Table 8.12 present the forecast level of demand for Passenger Ships. The following characteristics should be noted:

- Steady demand is forecast in this niche sector. The highest levels of demand are forecast in the smallest size band, below 5,000 gross tonnes, with fairly even demand above that size.

- The large cruise sector is the most significant in terms of gross tonnes produced, but this translates into a very small number of contracts, only three deliveries peryear on average.

Figure 8.15a : FUTURE LOW CASE DEMAND - PASSENGER

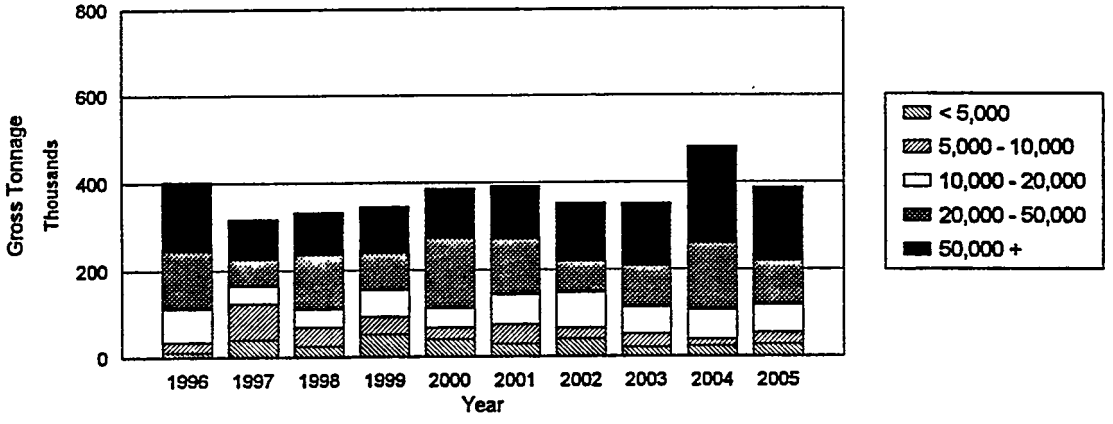


Figure 8.15b : FUTURE BASE DEMAND - PASSENGER

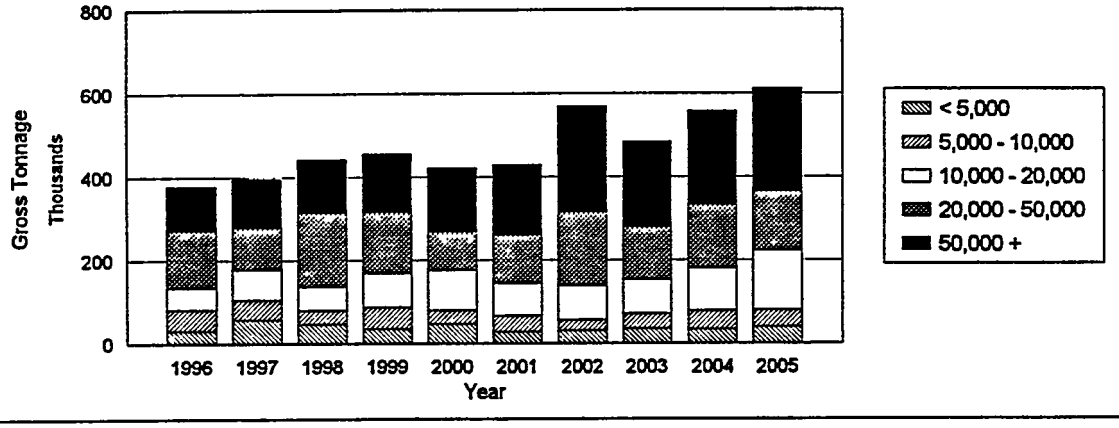


Figure 8.15c : FUTURE HIGH CASE DEMAND - PASSENGER

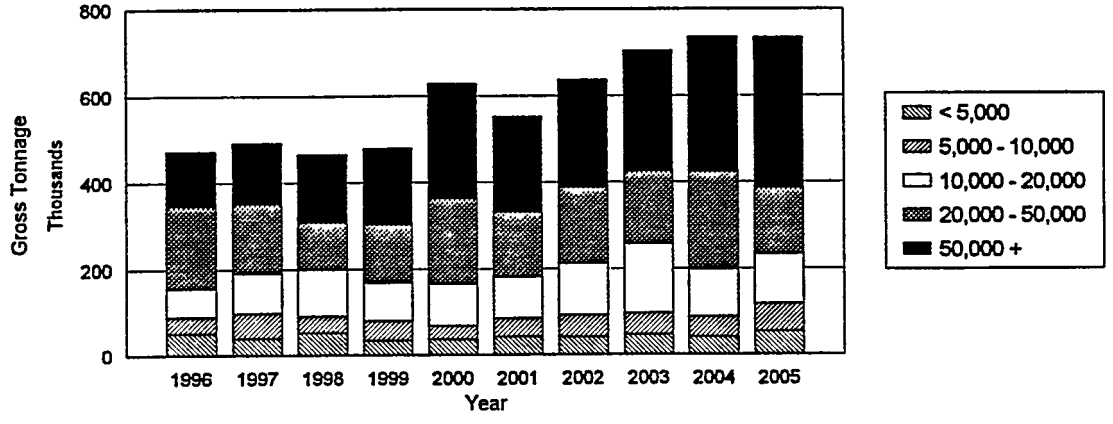


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Figure 8.15d : FUTURE LOW CASE DEMAND - PASSENGER

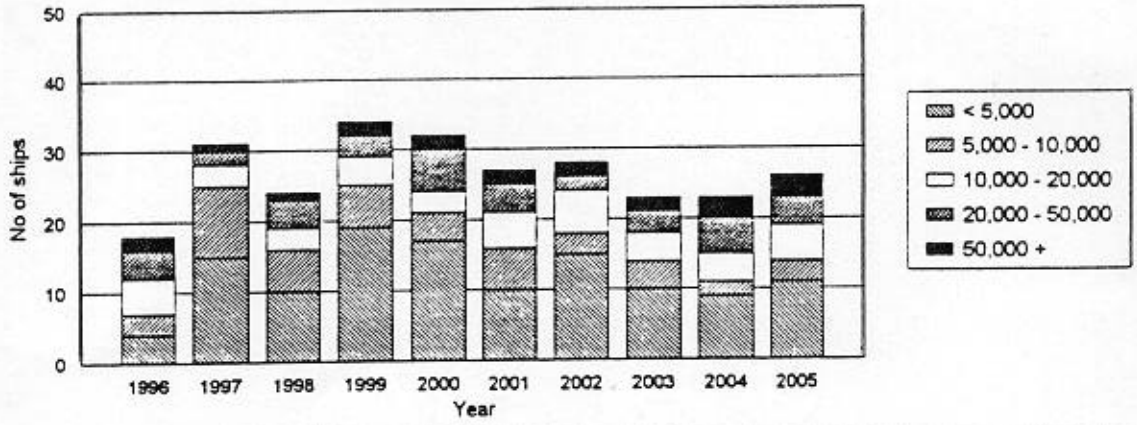


Figure 8.15e : FUTURE BASE DEMAND - PASSENGER

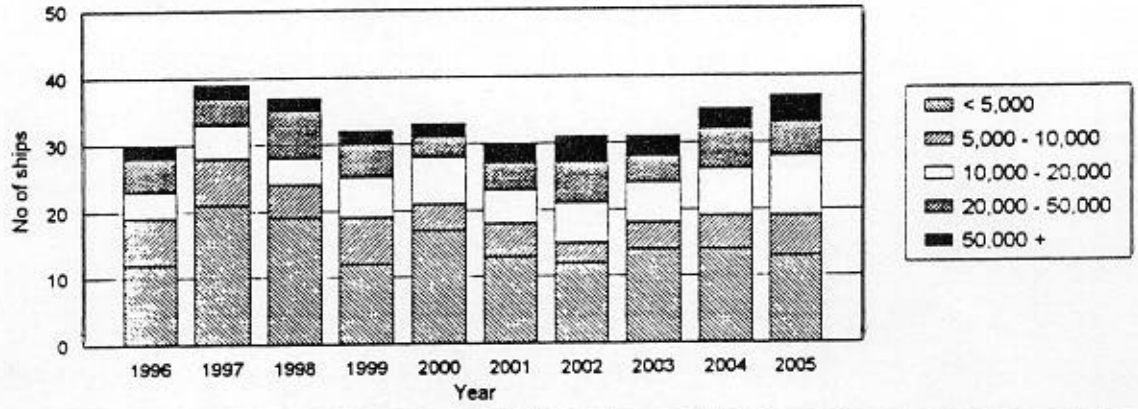
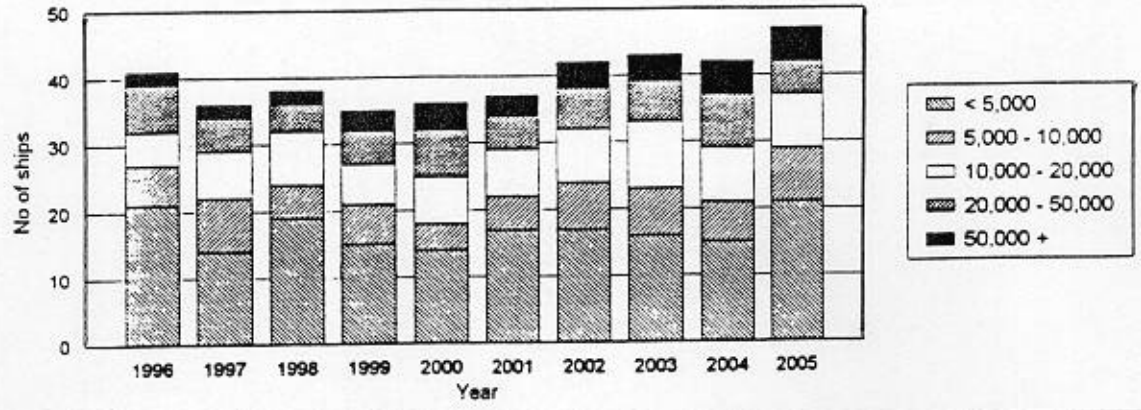


Figure 8.15f : FUTURE HIGH CASE DEMAND - PASSENGER



[spfa174c 11-May-1995]

Table 8.12

FORECAST DEMAND CHARACTERISTICS - PASSENGER

Range GT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
<5,000	12	15	17	31,218	38,349	43,964
5,000-10,000	5	5	6	35,829	39,448	46,408
10,000-20,000	4	6	7	61,710	85,385	105,862
20,000-50,000	4	5	6	110,188	137,141	166,444
50,000+	2	3	3	135,784	174,777	227,480
Total	27	34	40	374,188	474,099	590,158

8.2.12 RoRo

Figures 8.16a to 8.16f and Table 8.13 present the forecast level of demand for RoRos. The Following characteristics should be noted:

- Demand for RoRos peaks in the second half of the forecast period, and in the low case not until the end of the forecast.

- Greatest demand is seen in the small size ranges, below 20,000 GT and with almost negligible demand for very large RoRos above 40,000 GT.

Figure 8.16a : FUTURE LOW CASE DEMAND - RO-RO

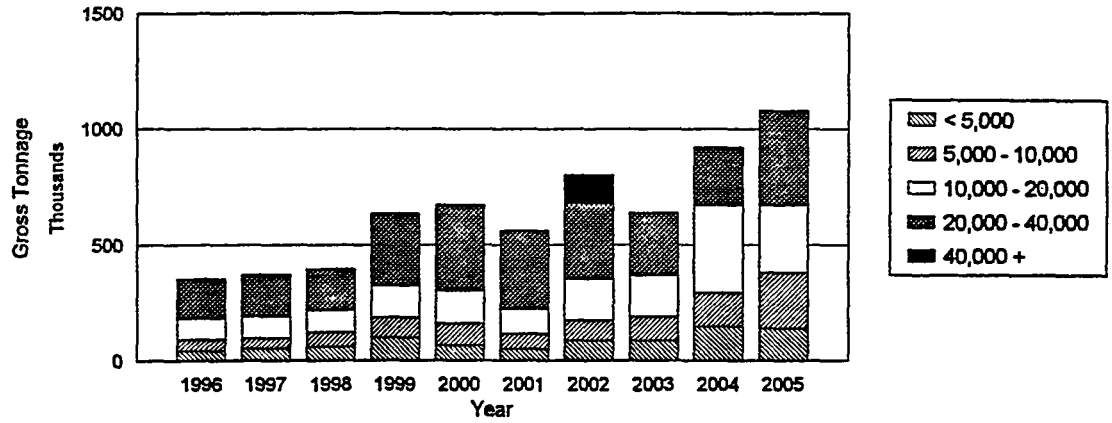


Figure 8.16b : FUTURE BASE CASE DEMAND - RO-RO

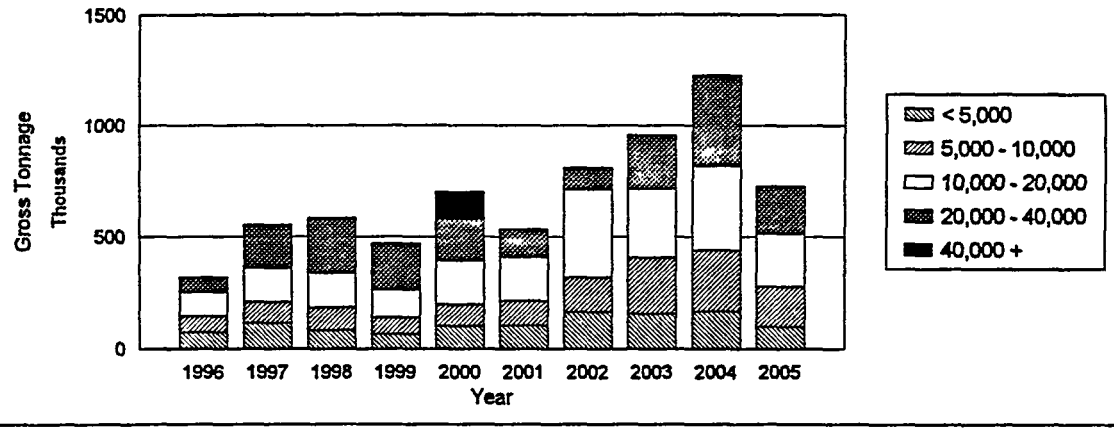


Figure 8.16c : FUTURE HIGH CASE DEMAND - RO-RO

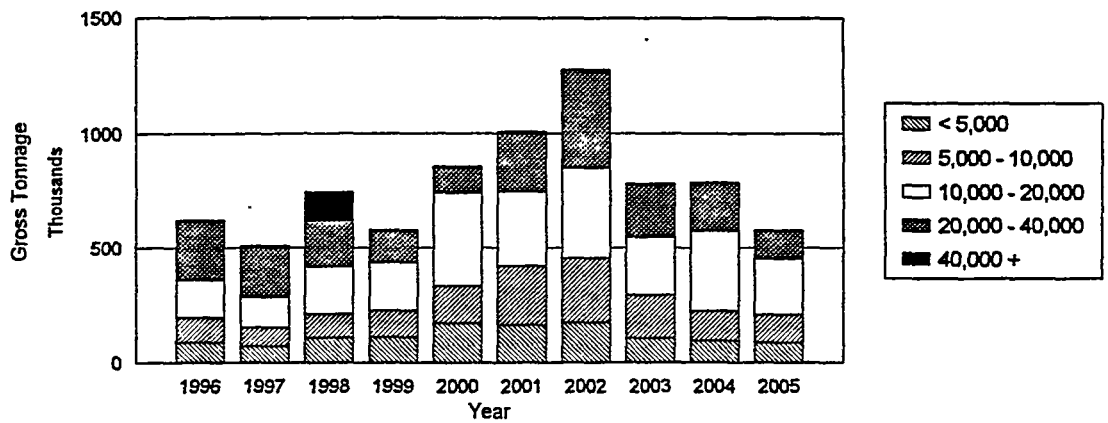


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Figure 8.16d : FUTURE LOW CASE DEMAND - RO-RO

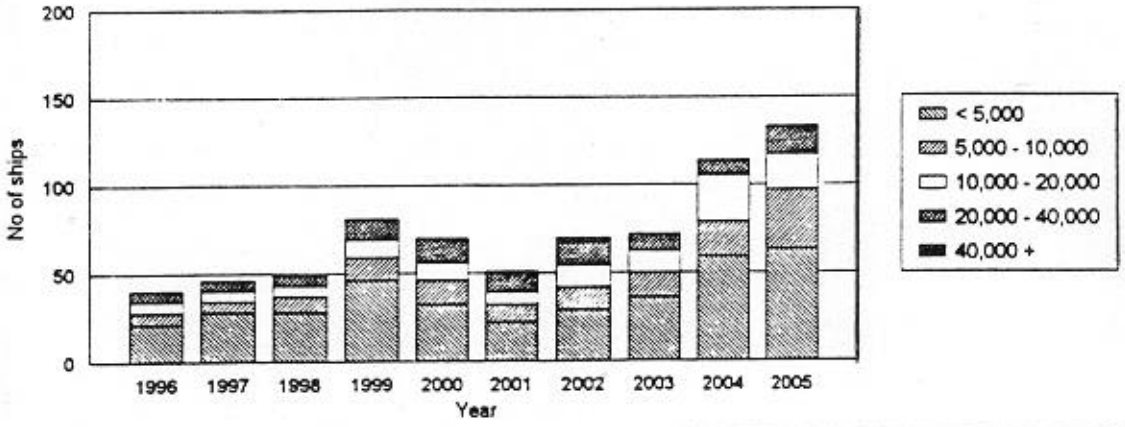


Figure 8.16e : FUTURE BASE CASE DEMAND - RO-RO

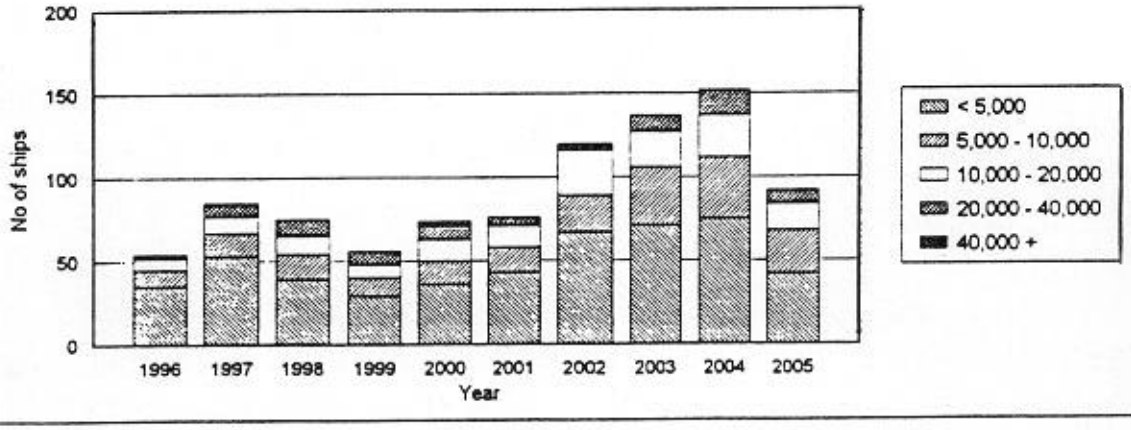
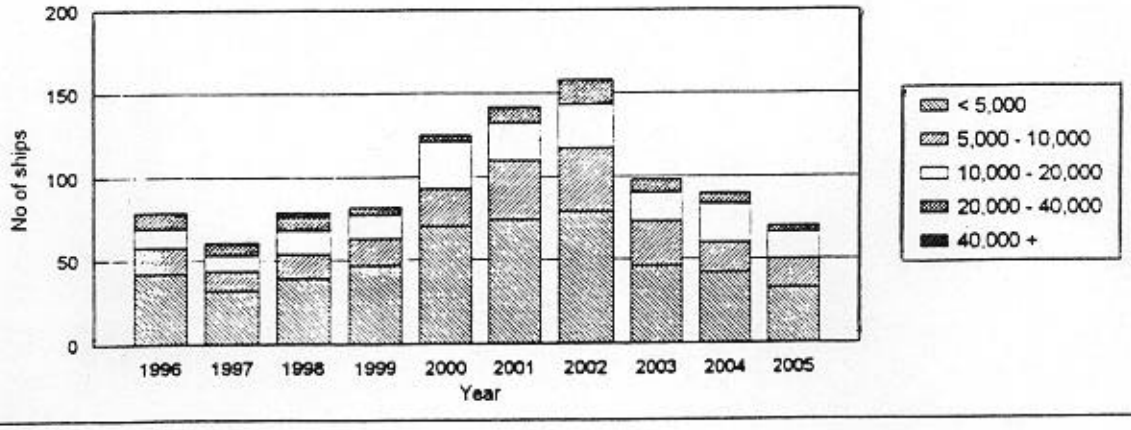


Figure 8.16f : FUTURE HIGH CASE DEMAND - RO-RO



[spfa175c 11-May-1995]

Table 8.13

FORECAST DEMAND CHARACTERISTICS - RORO

Range GT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
<5,000	36	49	50	83,094	113,010	118,390
5,000-10,000	14	20	22	98,013	140,255	155,169
10,000-20,000	12	15	18	170,141	224,773	269,025
20,000-40,000	10	8	8	279,116	198,240	215,953
40,000+	o	0	0	12,179	12,179	15,785
Total	73	92	98	642,542	688,457	774,322

8.2.13 Car Carriers

Figures 8.17a to 8.17f and Table 8.14 present the forecast level of demand for Car Carriers. The following characteristics should be noted:

- Demand is forecast to build up to a peak towards the end of the forecast period, and is fairly evenly spread across all size ranges.

Figure 8.17a : FUTURE LOW DEMAND - VEHICLE CARRIER

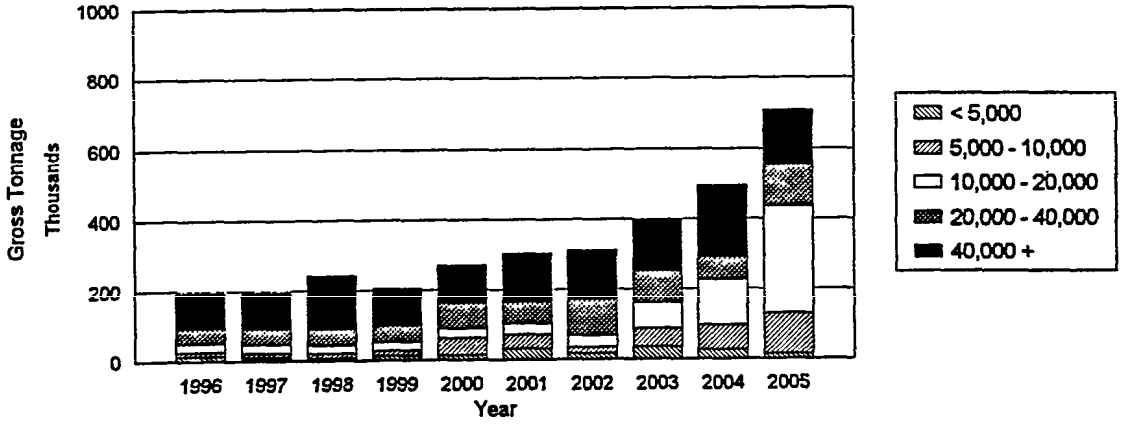


Figure 8.17b : FUTURE BASE DEMAND - VEHICLE CARRIER

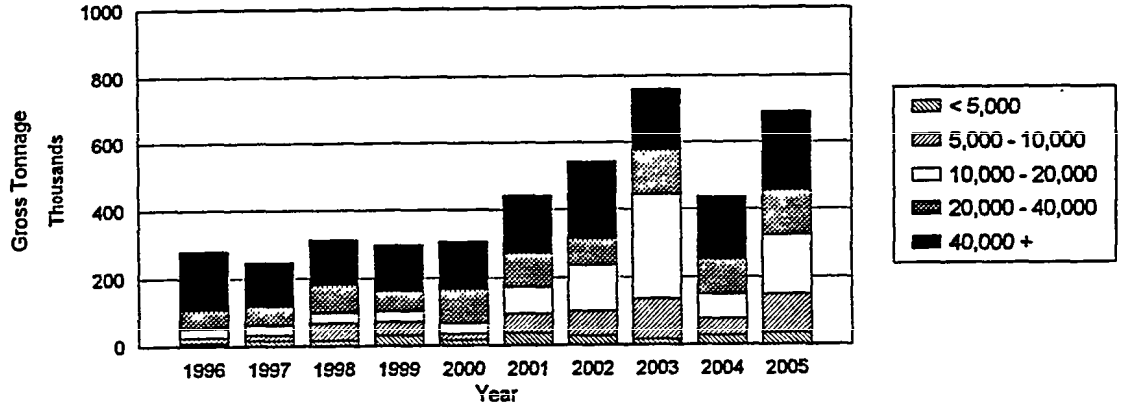
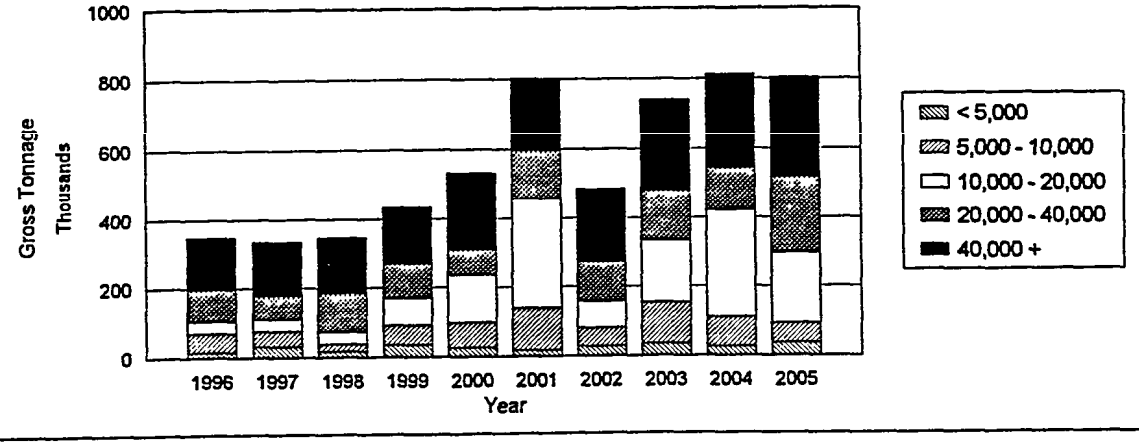


Figure 8.17c : FUTURE HIGH DEMAND - VEHICLE CARRIER



[spfa176c 11-May-1995]

Figure 8.17d : FUTURE LOW DEMAND - VEHICLE CARRIER

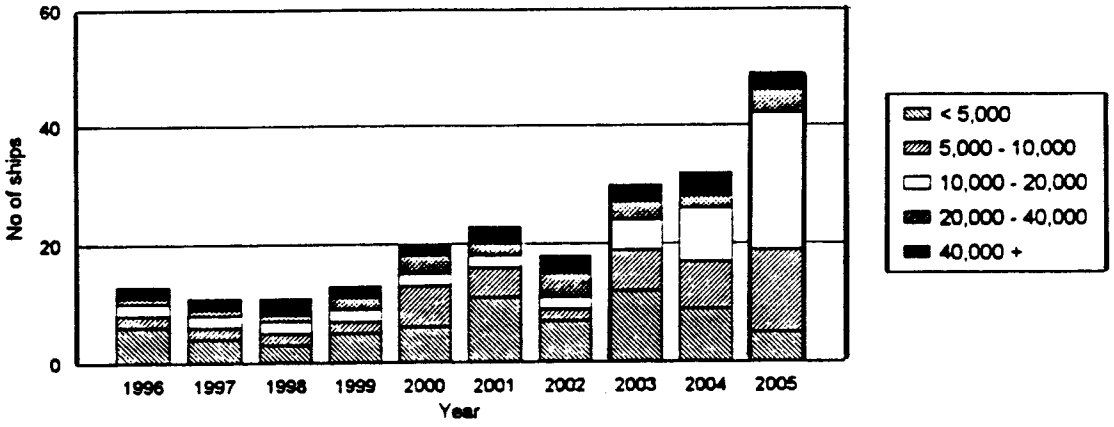


Figure 8.17e : FUTURE BASE DEMAND - VEHICLE CARRIER

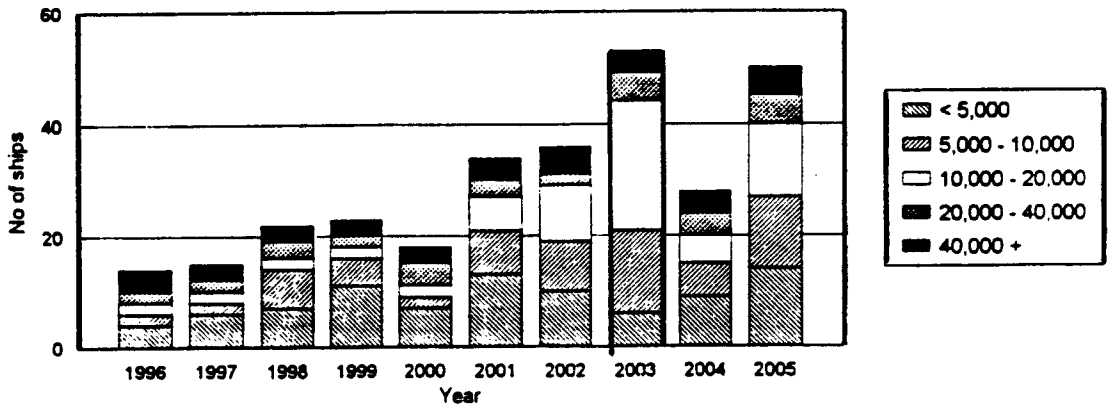
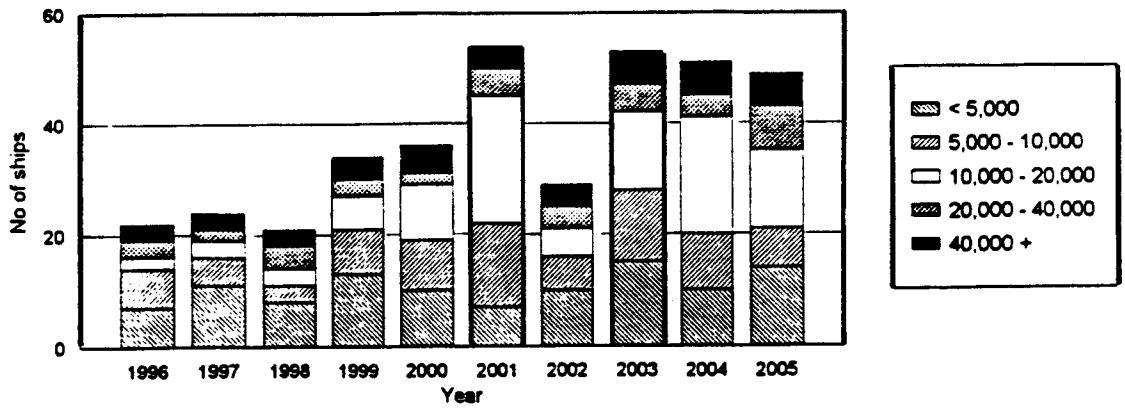


Figure 8.17f : FUTURE HIGH DEMAND - VEHICLE CARRIER



[spfa176c 11-May-1995]

Table 8.14

FORECAST DEMAND CHARACTERISTICS - CAR CARRIERS

Range GT	Average Number per Annum			Average GT per Annum		
	Low	Base	High	Low	Base	High
<5,000	7	9	11	17,951	22,590	27,226
5,000-10,000	5	7	8	40,369	55,953	68,506
10,000-20,000	5	7	10	69,433	92,392	140,677
20,000-40,000	2	3	4	68,746	89,700	118,184
40,000+	3	4	4	135,988	171,642	209,149
Total	22	29	37	332,487	432,277	563,741

9. NEWBUILDING COMPETITION

9.1 INTRODUCTION

The following section reviews the competitive conditions in the newbuilding market for each ship type. The leading shipbuilders in each sector are identified, but above all the potential for export orders for US shipyards is reviewed. Shipbuilding in general shows a strong preference for domestic ordering in many countries, in particular Japan, with almost all Japanese ships built in home shipyards, although the problems of the yen have recently led to a small number of Japanese ships being imported - a situation that would have been unthinkable five years ago.

Section 9.2 presents an overview of the market on a national level, and describes how market shares have changed over the past decade, highlighting in particular the relentless rise of South Korea. (The changing distribution of orders has been examined by comparing the build pattern of ships completed between 1985 and 1989 with those ordered between 1989 and 1994). This is followed by an analysis of competitive conditions in each sector of the market, taking into account:

- Nationality of the fleet.
- Relevance of US flag ships.
- Incidence of domestic ordering.
- **Market leaders.**

These competitive conditions can then be reviewed along with the demand forecast, to identify the market sectors offering the greatest potential for US shipyards.

Finally, the level of shipbuilding capacity available is reviewed against the forecast of demand, to examine future capacity utilization and identify any over- or under-capacity situations.

9.2 COMPETITION OVERVIEW

- Although over the last five years Japan and South Korea have remained the two major shipbuilding nations, the shape of newbuilding activity over the period has changed. Newbuilding activity as indicated by ships on order is illustrated in Figures 9.1a and 9.1b.

Figure 9.1a : DWT ON ORDER

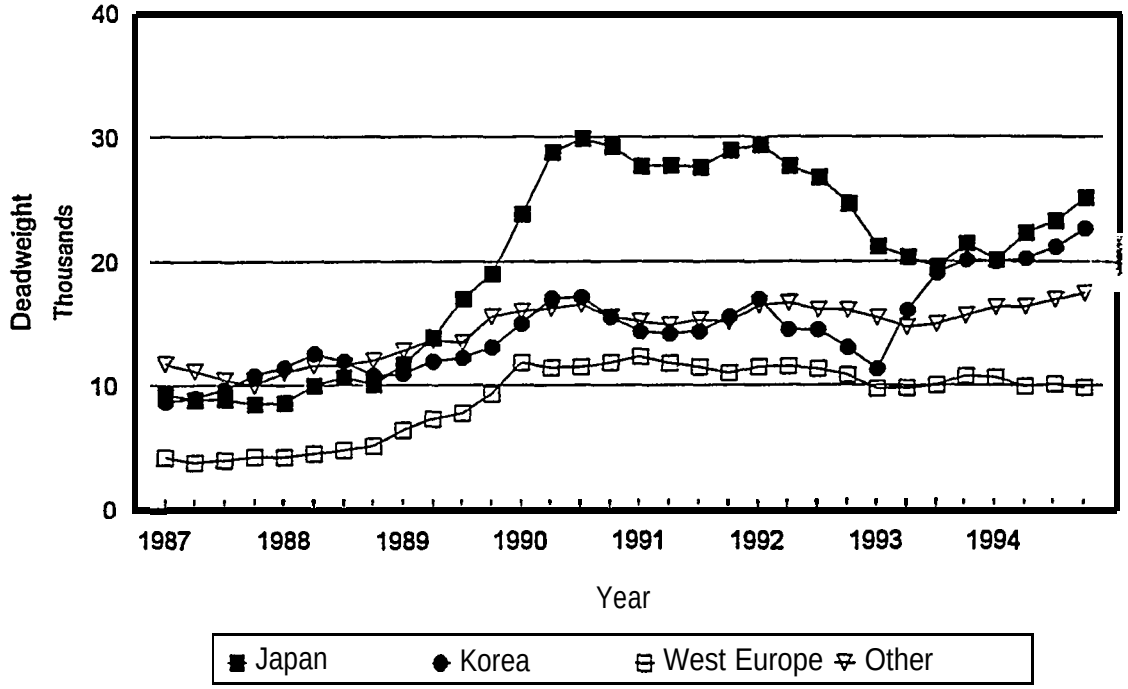
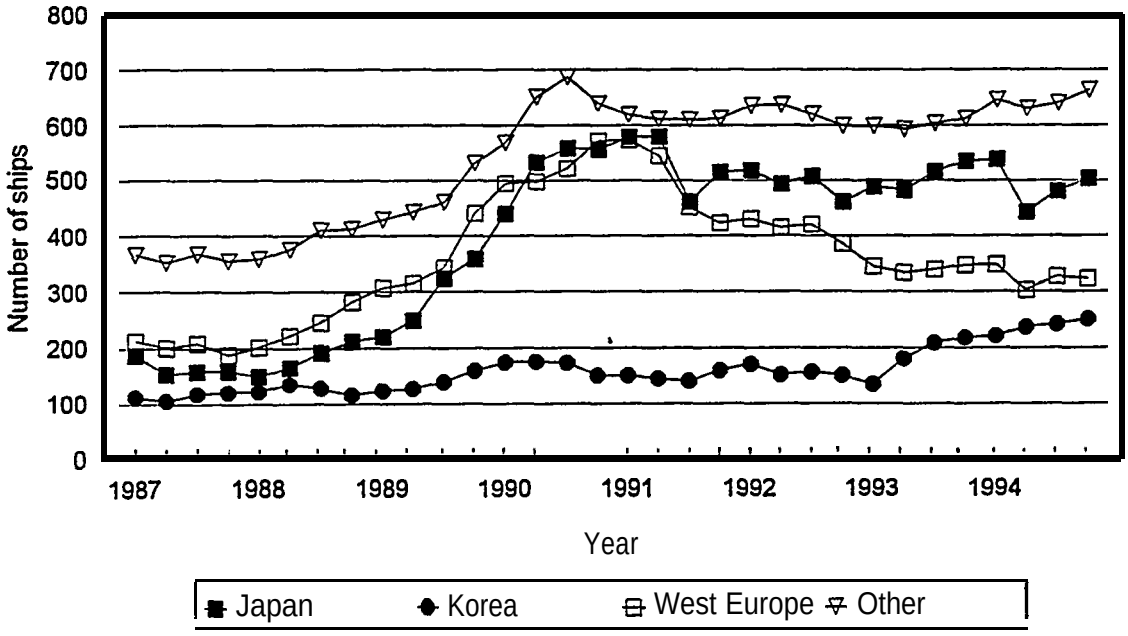


Figure 9.1b: SHIPS ON ORDER



spfa178a 16-March-1995]

- At the beginning of 1990 the distribution of orders, according to deadweight was:

  - Japan 36%
  - South Korea 22%
  - Europe 18%
  - Other 24%

  At that time Japan was that market leader. This was fueled by the wave of tanker fleet replacement expected to fill the yards in the early 1990s.

- During 1990 and '1991 Japanese shipyard order books fluctuated between 27m - 30m deadweight after a significant rise in orders from 23.9m during the first quarter of 1990. During the same period the South Korean order books rose and fell cyclically about the 15m deadweight mark, whilst European shipbuilders maintained an almost constant level of orders, at approximately 12m deadweight. The remaining shipbuilding nations followed a similar pattern in both shape and magnitude to Korea's order books.

- During 1992 the World total order book fell by 23% in deadweight terms over the year, but the distribution of orders between the four nations remained almost unchanged.

- It was the period starting in the first quarter of 1993 through to the yearend that resulted in major change in the distribution of orders between nations. At the beginning of 1993 Japan had almost twice the volume of the South Korean yards on order. By October 1993 the Koreans had boosted the order book to match Japan's at 20 million deadweight.

- Japan's loss of dominance in the newbuilding market was due to a number of factors, which to a large degree the shipbuilders had very little control over. The continuing appreciation of the Yen combined with the fact that the tanker fleet replacement expected to fill the Japanese yards had yet to arrive. (Interestingly, the strength of the yen saw for the first time Japanese bulk cam"ers being ordered in South Korea). Whilst Japan's order books were continuing to fall, the Korean shipbuilders were busy instigating an aggressive marketing strategy, along with capacity increases, cutting prices to a level which dramatically triggered the upturn of activity seen starting at the beginning of 1993.

  In the six months that followed, th~ Korean shipbuilders secured sufficient new business to cover the majority of their berths for almost three years ahead to the middle of 1996.

- During 1993, outside Japan & South Korea, European shipyards had benefited from favorable credit arrangements and relatively weak currencies against the dollar. These factors, combined with the increased competitiveness of the German and Scandinavian yards, meant that although the European yard's order book remained constant at approximately 10m deadweight their market share was also maintained, such that at the end of 1993, the distribution of orders, according to deadweight was:

  - Japan 30%
  - South Korea 30%
  - Europe 16%
  - Other 24%.

- Whilst at the end of 1993 Japan had marginally lost its position as the market leader, during 1994 Japanese yards succeeded in capturing the largest share of new orders. Japanese yards, whilst continuing to struggle against the ever strengthening Yen, began to instigate cost cutting exercises including large white collar redundancies and a commitment by domestic steel producers to cut material prices by up to 10'YO.

- At the same time, as the South Korean slipways and berths became almost entirely full well into 1997, the price reductions offered during 1993 began to fade.

- During the same period European yards again maintained order books at approximately 10m deadweight, however failing to capture past market shares. At the end of 1994, the distribution of orders according to deadweight was:

  - Japan 34%
  - South Korea 30%
  - Europe 13%
  - Other 23%.

- Looking towards the future, Japan will continue to struggle against the strength of the Yen, taking minimum export orders whilst looking further to improve productivity by investing heavily in R&D, combined with production cost cuts in an attempt to compete successfully with the South Koreans.

- Whilst the South Korean shipbuilders have recently come under criticism from other shipbuilding nations over various plans to increase capacity, orders for the new yards have been slow to build-up. Wtih the remaining yards mostly covered into 1997.

- In Europe, shipbuilders are likely to futiher improve productivity and still further improve their competitiveness on the wodd market. However it is unlikely that their market share will rise in the short to medium term. Elsewhere the problems of loans and guarantees in the Former Soviet and Eastern European states are likely to continue to cause problems for shipyards trying to achieve orders. However, the low cost and price of such ShiPS will continue to tempt owners towards Poland and Ukraine and with the removal of subsidies countries such as Poland, already operating withoti such assistance, are likely to further increase their competitiveness.

9.3 COMPETITIVE ANALYSIS BY SECTOR

9.3.1 Tankers

- There have been only minor changes in the distribution of tanker orders over the past decade. Japan dominates the tanker building market, followed by South Korea, with the following market shares of orders since 1989:

Japan	:	34%
South Korea:		21%
Europe	:	18?A0
Others	:	27%

Other countries that feature importantly in this sector include China, Taiwan, Croatia, Brazil and Ukraine.

- In recent years, Japan has held onto its market leadership by investing in new facilities and working practices:

  - IHI has recently spent $78 million on double hull tanker facilities.

  - Sumitumo has spent $10 million to improve construction processes.

  - Mitsubishi, who experienced a fall in tanker orders in the early to mid 1980s, have invested and as a result have increased market share in the VLCC market in particular.

- Exporting is a strong feature of tfjs market, with 66% of orders placed since 1989 being for export. Having said this, two of the major owning blocks exhibit very strong domestic build preferences: over 99V0 of both Japanese and South Korean tankers ordered since 1989 have been built in domestic shipyards.

- Despite this, this market sector still shows very good opportunities for export orders, due to the high demand volume, and the wide range of ownership. Japan owns less than 9% of the fleet and South Korea is a minor owner.

- In addition to providing export oppotiunities, US owners feature significantly in this sector, providing opportunities for domestic shipyards. 13.2% of the fleet is US owned, and of these 45% (178 ships) are US flag.

- Detailed analysis reveals that Japanese and South Korean builders predominate in the larger sectors above 50,000 dvvt, but with a much wider range of competitors below this size.

- In the small tanker range **below** 20,000 **dwt** the competition is widely spread. 251 orders reported since 1989 were spread amongst 82 shipyards, an average order density of three ships per yard. There is some scope apparent for standard designs in this sector, but the predominant pattern is for single or short series orders. The market leaders in this sector are as follows:

Nationality	**Shipyard**	**Orders 1989 to ~994**
Germany	MIVV	9
Russia	Admiralteiski	11
Malaysia	MSE	17
Japan	Shin Kurishima	17
Spain	Juliana	6
South Korea	Daedong	9
Singapore	Atlantis	9
Italy	S Esercizio	5
Taiwan	Ching Fu	5
Singapore	Jurong	8
Germany	Lindenau	4
Japan	Fukuoka Zosen	8
Japan	Asakawa Zosen	6

The Japanese built ships are primarily for Japanese owners, but with good expor& markets for other builders.

- The incidence of export building is much higher in the handysize sector **between 20,000 and 50,000 dti,** with good opportunities for series building and a number of standard designs have developed. 229 orders since 1989 have been shared between 43 shipyards, an average order density of 5.3 ships per shipyard. The nationality of builders is widely spread, although the Halla Shipyard has emerged strongly in this sector as the market leader. The main competitors are:

Nationality	Shipyard	Orders 1989 to 1994
South Korea	Halla	31
Spain	Astilleros Espanoles	18
China	Dalian	13
Ukraine	Chemomorsky	10
Japan	Onomichi Zosen	10
Croatia	Trogir	8
Ukraine	Kherson	11
Japan	Imbari Zosen	8
USA	Newport News	8
Croatia	Uljanik	8

The majority of Japanese orders and all of South Korea's orders are for export, and this sector provides excellent export opportunities.

- In the panamax sector, 50,000 to 100,000 dwt competition shifts to be dominated by Japanese shipyards, with South Korea in second place; in general South Korea concentrates on the largest size bands above this size. The export market is very important in this sector, and the oppofiunity exists to offer standard designs and series orders, with 200 orders since 1989 spread amongst 29 shipyards, an order density of 6.9 orders per yard. Japanese shipyards dominate although South Korea's Samsung Shipyard is the market leader, as follows:

Nationality	Shipyard	Orders 1989 to 1994
South Korea	Samsung	26
Japan	Imbari Zosen	19
Japan	Namura Zosen	19
South Korea	Hyundai	19
Japan	Sumitomo	14
China	Dalian	11
Japan	Koyo Dockyard	9
Italy	Fincantieri	9
Ukraine	Zaliv	12

- In the aframatisuezmax sector, **100,000 to** 200,000 **dwtj** Japan and South Korea dominates, but with also a high level of participation from European shipyards. As with all tanker sectors there are good opportunities for export orders, series building and standard designs. 166 orders since 1989 have been shared between 26 shipyards, an order density of 6.4. The market leaders are as follows:

Nationality	Shipyard	Orders 1989 to 1994
South Korea	Hyundai	20
Spain	Astilleros Espanoles	14
South Korea	Samsung	13
South Korea	Daewoo	12
Japan	Mitsui Zosen	12
Croatia	Split	11
Japan	IHI	9
Brazil	Ishibras	8
Japan	Namura Zosen	9
Japan	Onomichi Zosen	10
UK	Hariand & Wolff	7

- The VLCC sector, **over** 200,000 **dv@** is the goal that many shipbuilders are trying to achieve. The market is dominated by Japan and South Korea, but with competition emerging from Europe. Three of the E3 tanker design have now been ordered from Astilleros Espanoles, and Odense has taken orders for six VLCCS for parent company A P Moller, along with three orders for export. There are many other shipyards capable of building in this sector that have not yet taken orders, and new yards are emerging in China and South Korea. Competition in the VLCC sector is likely to become intense. The order density is very high, at 12.3 orders per shipyard since 1989, 184 orders spread amongst 15 shipyards. However, APA estimate that there are already more than 30 shipyards capable of constructing VLCCS with more under construction. The market leaders at this time are as follows:

Nationality	Shipyard	Orders Since 1989
South Korea	Daewoo	36
Japan	Mitsubishi	25
South Korea	Hyundai	24
Japan	Hitachi Zosen	23
Japan	IHI	14
Denmark	Odense	9
Japan	NKK Corporation	9

9.3.2 Chemical Tankers

- This is a fairly specialized sector+ with a relatively small number of shipyards participating. Having said this, the opportunity for export orders is reasonably good: 58% of all orders placed since 1989 have been for export.

- The main concentration of capacity in this sector is in Europe, although Japan is the market leader, but with other emerging competitor nations such as Singapore, Malaysia and Indonesia. The market shares by main builder groups are as follows (orders since 1989):

Japan	:	31 Yo
South Korea:		2!40
Europe	:	40%
Others	:	26%

Further comments on these blocks are made as follows:

- **Japan: 70%** of orders taken were for domestic owners, with practically all Japanese ships built at home. Japan is less significant as an exporter in this sector.

- **South Korea:** South Korean yards appear to have moved out of this sector as the market for larger ships has increased.

- **Europe:** European owners predominate in this sector, and whilst exporting is strong, 80% of orders taken since 1989 have been for European owners. Having said this, 40% of orders since 1989 for European owners were placed outside Europe and the market is by no means closed.

- **Others:** Generally the more developed of developing countries, capable of building sophisticated ships, such as Singapore or Malaysia. Beyond this, the order book is widely spread.

- In the sector **below 10,000 dwt,** Japanese and European builders dominate with a tendency towards domestic building in the smaller sizes. Other competition is scattered, but contains the greatest element of export ordering. 102 orders since 1989 have been shared amongst 38 shipyards, an order density of 2.7 orders per yard. The incidence of long series and standard designs in this sector is low, and ordering is fairly scattered, the main builders being:

Nationality	Shipyard	Orders Since ‘f989
Japan	Asakawa Zosen	14
Russia	Baltic	'10
Italy	Soc Esercizio	6
Japan	Higaki	6

- The opportunity to achieve export ordering increases with size, but so does the degree of specialization of shipyards, as indicated by an increasing order density. In the size band between 10,000 **and 20,000 dwtj 38** orders since 1989 have been shared between **12** shipyards, a density of 3.2 orders per yard. European shipyards predominate in this sector, with the leaders being as follows:

Nationality	Shipyard	Orders Since 1989
Germany	M17/V	8
Japan	Shin Kurishima	7
Norway	Kvaemer Kleven	4
Indonesia	Kodja Bahari	4

- Europe also dominates in the largest size band, over 20,000 dwt, with specialization increasing even futther: 52 orders since 1989 have been shared amongst 10 builders, an order density of 5.2. Export opportunities in this sector are good, and market leaders are as follows:

Nationality	Shipyard	Orders Since 1989
Nonvay	Kvaemer Kleven	12
Denmark	Danyard	10
Japan	Minami Nippon	6
Romania	Galatz	5
Japan	Shin Kurishima	6
UK	Kvaemer Govan	5

9.3.3 Bulk Carriers

- The significant Japanese market for bulk carriers (around 13% of this very large fleet is Japanese owned) is closed, with all but very few Japanese ships built abroad. Despite this, export opportunities are good due to the sheer size of the fleet, and the wide range of ownership nationalities. 56% of orders since 1989 have been built for export.

- Market shares amongst the major blocks since 1989 have been as follows:

Japan : 51%
South Korea: 18%
Europe : 6'%0
Other : 25%

European yards have been little involved in this sector in recent years.

- Competitive conditions are fairly good in this sector, although it has to be said that prices are generally low. As with other sectors, export potential increases with size, although interestingly in the VLBC sector above 200,000 dwt export orders are at this time non-existent. Order density is generally very high, with good opportunities for standard designs and series building.

The sector **below** 20,000 **dwt** is small, and in this range the distinction between bulk carriers and single deck general cargo ships is difficult to make. 81 orders since 1989 were placed with 29 shipyards, order density 2.8, and with a fairiy high degree of domestic ordering. Japan is the leader, with little participation from South Korean yards, who are concentrating on exporting larger ship sizes, but with generally a wide spread of owners. The market leaders areas follows:

Nationality	Shipyard	Orders Since 1989
Poland	Szczecin	**14**
Japan	Shikoku Dockyard	10
China	Xingang	**5**
Bulgaria	Vama	**4**
China	Shanghai Shipyard	**4**

The Polish orders were almost all for a single Polish owner, Polska Zegluga Morska, and the Japanese orders at Shikoku were also primarily domestic.

In the handysize/handymax range, 20,000 **to** 50,000 **dw&** Japan heavily dominates the market, with surprisingly little participation from South Korea, and almost no participation from Europe. The order dens-w is reasonably good at 9.5, with 545 orders since 1989 shared between 52 shipyards. There are good opportunities for standard designs and series building in this sector, with the market leaders being as follows:

Nationality	Shipyard	Orders Since 1989
Japan	Oshima	65
Japan	Tsuneishi Zosen	35
Japan	Imbari Zosen	34
South Korea	Daewoo	23
South Korea	Hyundai	23
Japan	Hashihama	20
Japan	Mitsui	17
Japan	Sanoyas	14
Japan	Kanasashi	21
China	Guangzhou	19
China	Jiangnan	15
Japan	Saiki	25

The pattern is only slightly different in the panamax sector, from 50,000 **to** 90,000 **dwt,** which is dominated by Japan, and with only slightly greater participation from South Korean and European shipyards than in the handysize sector. Export potential is very good, with around 70'% of Japanese panamax bulkers exported, and the order density is high at 9.5 orders per yard, with 266 orders since 1989 spread amongst 28 shipyards. There are good opportunities for standard designs and series building and market leaders are as follows:

Nationality	Shipyard	Orders Since1989
Japan	Imbari Zosen	31
South Korea	Hyundai	17
Denmark	Burrneister & Wain	15
South Korea	Samsung	16
Japan	Hitachi Zosen	16
Japan	Hashihama	16
South Korea	Daewoo	15
China	Jiangnan	15
Japan	Sanoyas	14
Japan	Sasebo	12
Japan	Tsuneishi Zosen	12
China	Hudong	11
Japan	Sumitomo	10
Ukraine	Okean	10

The cape size sector, 90,000 to 200,000 dwt, sees an increase in South Korean participation, with Japanese and Korean shares almost equal. The China Shipbuilding Corporation of Taiwan is also an impoitant builder in this sector. Order density is good, at 7, with good opportunities for standard designs and series construction. Despite this however, European participation in this sector is again largely absent. 204 orders since 1989 have been shared between 29 shipyards, with the market leaders being as follows:

Nationality	Shipyard	Orders Since 1989
South Korea	Hyundai	36
Taiwan	China Shipbuilding	35
Japan	Kawasaki	17
South Korea	Daewoo	16
Japan	NKK	13
South Korea	Samsung	10

The VLBC sector, **above** 200,000 **dwt, is** small, and over the last five years all building has been for domestic markets : at this time there is no export market in this sector, although this could develop along with volume and South Korea is likely to emerge as the market leader. Orders placed since 1989 **have been as follows:**

Nationality	Shipy&d	Orders Since 1989
South Korea	Daewoo	4
Italy	Fincantieri	3
South Korea	Hyundai	3
South Korea	Samsung	1

9.3.4 OBO

This small market sector has become highly specialized. All orders since 1989 have been construcded in either South Korea (71%) or Europe (29%). Japan appears to have moved out of this sector, despite good standard design prospects and some opportunity for series ordering, particularity for the two main OBO builders, Burmeister & Wain and Hyundai.

Order density is fairly good, at five in the panamax sector and 9.3 in the cape size sector. The 38 orders placed since 1989 have been built at only five shipyards, as follows:

Nationality	Shipyard	Orders Since 1989
Panamax:		
Denmark	Burmeister & Wain	9
Italy	Fincantieri	1
Cape Size:		
South Korea	Hyundai	22
South Korea	Daewoo	5
Belgium	Boelwerf	1

9.3.5 General Cargo

596 general cargo orders have been placed since 1989, with 53% built for export. This fairly high degree of domestic ordering is somewhat surprising in this sector. Market shares by major regions are as follows:

Japan	30%
South Korea	7%
Europe	25%
Other	38%

The great majority of orders have been for small ships under 10,000 dwt, rather than larger multi-purpose carriers, and the pattern of competition varies considerably between the three size bands.

The competition is fragmented, although with a few identifiable market leaders, but in general the opportunity exists for standard designs and series building. Japan is the leading builder, but with emerging competition in particular from Eastern European countries, as outlined below.

In the small ship sector, below 10,000 dwt, Japan dominates, but with a heavy European presence also seen in this sector. 441 orders since 1989, have been placed in 96 shipyards, giving an order density of 4.6 orders per yard. The market is widely fragmented in this sector, but with the following identifiable market leaders:

Nationality	Shipyard	Orders Since 1989
Germany	J J Sietas	30
Japan	Higaki	23
Japan	Nishi Zosensho	22
Japan	Shin Kochi	13
Japan	Iwagi Zosen	16
Denmark	Orskovs	9
Bulgaria	Varna	9
Poland	Stocznia Polnocna	12
Denmark	Aarhus	10
Japan	Shin Kurishima	10
Russia	Krasnaya Sormovo	11
Japan	Miho	8
Ukraine	Kherson	6
South Korea	Dae Sun	9
Russia	Vyborg	12
Russia	Sevemaya	10

This is, in fact, a small ship sector, and the list of leading shipyards is very different to those seen in larger ship sectors.

In the 10,000 to 20,000 dwt size band European and Eastern European shipyards dominate, with little participation from Japan. 75 orders placed since 1989 have been built in 27 shipyards, an order density of only 2.8. Few standard designs have yet emerged in this sector, and building opportunities have been fairly few, although where they do exist export opportunities are good. The main builders since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
Romania	Galatz	6
Germany	Kvaerner Warnow-werft	9
Brazil	Emaq	4
Malaysia	MSE	6
Netherlands	Frisian	6
Russia	Yantar	5

Above 20,000 dwt, again opportunities for ordering have been fairly few, but where they do exist export potential is good. Eastern Europe and China are the leaders in this sector. 80 orders since 1989 have been placed in 18 shipyards, giving an order density of 4.4. The market leaders are as follows:

Nationality	Shipyard	Orders Since 1989
Croatia	Split	12
China	Guangzhou	9
Japan	Minami Nippon	7
Bulgaria	Varna	6
South Korea	Daewoo	6
South Korea	Hyundai	6
China	Shanghai Shipyard	6
Japan	Shin Kurishima	5

9.3.6 Container Carriers

At one level, competitive conditions in this sector appear to be very good. European shipyards lead the market, and export potential is excellent. In addition, this is an important market sector for US owners. Of 820 orders placed for container ships since 1989, 70% were for export, with market shares being as follows:

Japan :	22%
South Korea:	19%
Europe :	29%
Others :	29%

At another level however, competitive conditions in this sector are difficult. Firstly, the strong entry of Polish shipyards into the market at low prices has caused problems for established shipbuilders in higher wage cost countries, in Europe in particular. Prices are being held very low. Secondly, a high order density in this sector is indicative of a strong element of established specialist builders with proven standard designs. With demand forecast to rise only slightly and many established builders with far from full order books, competitive conditions in the container sector are best described as difficult.

Below 10,000 dwt the market is fragmented, with a wide range of builders. 117 orders since 1989 have been placed in 34 shipyards, giving an order density of 3.4 orders per yard. There is a strong tendency towards domestic ordering in this sector in both Japan and Western Europe. The market leaders since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
China	Quixin	7
South Korea	Dae Sun	11
Poland	Szczecin	5
Russia	Severnaya	5
Romania	Galatz	5
Germany	Volkswerft	5

In the sector between 10,000 and 20,000 dwt the market has become very much dominated by Polish shipyards and Szczecin in particular. It remains to be seen whether Poland can maintain the delivery performance required. 190 orders since 1989 were placed in 38 shipyards, giving an order density of 5. 36% were placed in the top three shipyards, and the order book is more fragmented than this density would suggest. The market leaders in the period since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
Poland	Szczecin	46
Poland	Gdynia	10
Spain	Astilleros Espanoles	12
Japan	Imbari Zosen	7
South Korea	Hanjin	6
Germany	MTW	8
Japan	Mitsubishi	6
Japan	Hayashikane	5
Japan	Kanda Zosen	5

The size band between 20,000 and 30,000 dwt is heavily dominated by European shipbuilders and Germany in particular. Again, a very small number of shipyards with standard designs lead the market with the top six shipyards accounting for 55% of orders since 1989. In total there have been 163 orders placed since 1989, in 29 shipyards, an order density of 5.6 orders per yard. The leading builders have been:

Nationality	Shipyard	Orders Since 1989
Poland	Szczecin	19
Japan	Naiki	17
Germany	Kvaerner Warnow-Werft	16
Germany	MTW	14
Japan	Shin Kurishima	13
Germany	Thysen Nordssea-Werke	10
South Korea	Hyundai	7
Germany	Seebeckwerft	9
Germany	Bremer Vulkan	6

The band between 30,000 and 40,000 dwt is fairly small. South Korea has been the leading builder over the past five years, building primarily for export. There have been 76 orders since 1989 spread over 18 shipyards, an order density of 4.2, with the market leaders being as follows:

Nationality	. Shipyard	Orders Since 1989
South Korea	Hyundai	13
South Korea	Halla	13
Spain	Astilleros Espanoles	7
South Korea	Daewoo	6
Poland	Gdynia	5

In the size range 40,000 to 50,000 dwt European shipyards again dominate, with a number of established specialist builders. The order density is fairly high at 6.7 orders per shipyard, reflecting the level of specialization. 167 orders were placed between 1989 and 1994, in 25 shipyards. the market leaders are as follows:

Nationality	Shipyard	Orders Since 1989
Germany	HDW	31
Taiwan	China Shipbuilding	13
South Korea	Samsung	13
Japan	IHI	9
South Korea	Daewoo	10
Japan	Mitsubishi	7
Denmark	Odense	6
Germany	Bremer Vulkan	9

- In the largest size range, **above** 50,000 dwt, to-date Japanese and South Korean shipyards have dominated the market, although designs have been developed in Europe, and Bremer Vulkan, HDW and Fincantieri have had some success in this sector. The market is fairly specialized, with the top six builders, all Japanese and South Korean, accounting for 75% of all orders since 1989. Since that time 107 orders have been placed in 16 shipyards, giving an order density of 6.7. The market leaders are as follows:

Nationality	Shipyard	Orders Since 1989
South Korea	Hyundai	18
Japan	IHI	15
South Korea	Hanjin	13
Japan	Mitsubishi	12
South Korea	Samsung	13
Japan	Koyo Dockyard	10

9.3.7 Reefers

Competition for refrigerated cargo carriers is concentrated in Japan and Western Europe, although with emerging competition from Eastern Europe. As with other sectors it remains to be seen how well Eastern European, and particularly former Soviet yards, perform.

Export potential is good, with 76% of ships built in European shipyards exported. Japanese builders on the other hand have a significant domestic market, accounting for 61% of contracts since 1989. Overall, 65% of the market was built for export.

Building is fairly specialized, with a number of yards dominating. It should be noted that one of the leading shipyards, Danyard, which is owned by a refrigerated cargo shipping company, has at this time moved out of this sector. This strategic decision was taken following the downturn in reefer trades in Europe in 1991, and it remains to be seen whether the shipyard will return to the market.

- The opportunities for specialization are good, although standard designs are not a strong feature of this market. Order density is around five in both sectors of the market examined.

- In the smaller sector under 10,000 dwt, 140 orders since 1989 have been placed in 26 shipyards. The market leaders are as follows:

Nationality	Shipyard	Orders Since 1989
Ukraine	61 Kommunar	18
Japan	Kyokuyo	18
Japan	Kitanihon	11
Poland	Gdansk	6
Spain	Enrique Lorenzo	7
Japan	Shin Kochi	7
Belgium	Boelwerf	7
Japan	Kanasashi	7
Spain	Naval Gijon	7
Netherlands	Van Diepen	7

The 61 Kommunar shipyard in Ukraine has taken a significant number of orders, but there are serious doubts about that yard's ability to meet delivery. Japanese yards predominate, with a high degree of domestic building.

- In the larger size band, up to 20,000 dwt, European shipyards predominate with a strong export order book. The Gdansk Shipyard has become a leading builder in this sector, and has taken over from Danyard as outlined above. The market leaders are as follows:

Nationality	Shipyard	Orders Since 1989
Denmark	Danyard	14
Poland	Gdansk	14
Japan	Shikoku Dockyard	10
Norway	Kvaerner Kleven	8
Japan	Shin Kurishima	6

The current problems of the Gdansk Shipyard highlight the potential problems of emerging Eastern Bloc shipyards and casts some concern over the very large number of orders taken by other Polish builders. Gdansk was unable to cope with the backlog taken and has spent 1993 and 1994 extricating itself from bankruptcy. Other Eastern Bloc yards may encounter a similar situation.

9.3.8 LPG Carriers

This is a small niche sector of the market, although it is not as highly specialized as the LNG sector, and the nationality of builders is fairly widely spread. Unlike LNG carriers, LPG ships can be built in fairly basic shipyards and some have recently been built in China, for example. For this reason, the market is more fragmented than would be expected.

- Around 60% of orders are for export, and overall market shares are as follows:

Japan	:	49%
South Korea:		13%
Europe	:	32%
Others	:	6%

- South Korea is a new entrant, taking export orders. Western European shipyards lead the market below 40,000 dwt, with Japan being both the main builder and owner of ships above that size. In Europe, Italian shipyards have led the order book, linked to the domestic market.

  Order densities are mostly low, and there is little opportunity for specialization or standardization in this sector. Order volumes are also low in each sector.

- In the smallest size band, under 10,000 dwt, 26 orders since 1989 have been spread between 12 shipyards, with the market leaders as follows:

Nationality	**Shipyard**	**Ordere Since 1989**
Indonesia	Kodja Bahari	4
Germany	Brand Werft	3
Japan	Asakawa Zosen	3
Japan	Kitanihon	3
Netherlands	J Pattje	3

- Very few orders in the range 10,000 to 20,000 dwt have been placed recently, with Italian yards dominating this small sector. The order book since 1989 has been as follows:

Nationality	Shipyard	Orders *Since* 1989
Italy	Ferrari	2
South Korea	Hyundai	1
Italy	Benetti	2
Italy	Esercizio	1

- In the larger size ranges, Japan and South Korea predominate. In Japan's case this is linked to a strong domestic order book with few opportunities for non-Japanese builders above 20,000 dwt.

- In the size band between 20,000 **and 40,000 dwt** the following orders have been placed since 1989:

Nationality	Shipyard	Orders Since 1989
South Korea	Hyundai	8
Belgium	Boelwerf	2
Japan	Kawasaki	2
Italy	Fincantieri	1
Italy	Ferrari	1
Italy	Apuania	1

- The range between 40,000 **and 50,000 dwt is** even more specialized, with Japanese yards and domestic orders making up two thirds of the market. The following orders have been placed since 1989:

Nationality	Shipyard	Orders Since 1989
Japan	Mitsubishi	8
Japan	Kawasaki	7
UK	Kvaerner Govan	2
South Korea	Hyundai	1

- A similar situation exists **above 50,000 dwt,** with all recent orders taken in Japanese shipyards, as follows:

Nationality	Shipyard	Orders Since 1989
Japan	Mitsubishi	9
Japan	NKK	3
Japan	Kawasaki	1

9.3.9 **LNG Carriers**

- This is a very small niche sector, with a handful of highly specialized builders. Having said this, it is a relatively important sector for US owners; 13 of the 14 LNG carriers in the US fleet are US flagged, and this may give an advantage to US yards in this niche sector.

- The degree of specialization required leads to a good export demand. Japanese and European yards have traditionally lead this sector, although Hyundai has recently been promoting its capability as an LNG builder.

The specialist builders with orders in this sector since 1989 are as follows:

Nationality	Shipyard	Orders Since 1989
10,000 to 30,000 dwt:		
Italy	Fincantieri	2
Japan	Kawasaki	2
Japan	NKK	2
30,000 to 60,000 dwt		
Japan	IHI	2
60,000 to 70,000 dwt:		
France	Chantiers de L'Atlantique	5
Japan	Mitsubishi	3
South Korea	Hyundai	3
South Korea	Hanjin	1
Japan	Kawasaki	1
Over 70,000 dwt:		
Japan	Mitsubishi	5
Japan	Mitsui	4
Japan	Kawasaki	3

9.3.10 Ferries

- Japan has the largest single order book in this sector, although these are almost all for domestic owners. European shipyards also have reasonably good order books, with a surprisingly healthy export workload (54% of European orders since 1989), although the majority of these are exported within Europe. Actual market shares since 1989 have been as follows:

	Market Share	% Exported
Japan	30%	3%
South Korea	0%	0%
Europe	32%	54%
Other	37%	72%

• The European export market for ferries is largely made up of larger ships over 20,000 gross tonnes. Below this size, export opportunities are relatively few, although the export of small fast catamaran ferries has provided good business for a small number of specialized builders.

- There is little opportunity for standardization and series building in this sector and order densities are very low. Specialization is also much less than would be expected for this ship type, with a large number of shipyards registering single orders.

- The smallest size range, under 5,000 GT is the most fragmented, with a wide range of builders, many of whom have taken single orders, often related to local opportunities. The leading shipyards since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
Australia	international Catamarans	17
Australia	Austal	26
Finland	Finnyards	6
Japan	Hayashikane	8
Japan	Mitsubishi	5

- In the 5,000 to 10,000 GT range domestic ordering predominates, both in Japan and Europe. Local opportunities again provide the greatest potential. Market leaders are difficult to identify, due to the fragmented nature of the sector. 31 orders have been placed in 9 shipyards since 1989, with the leaders as follows:

Nationality	Shipyard	Orders Since 1989
Japan	Mitsubishi	5
Japan	Saiki	3
Japan	Kanasashi	2
Spain	Astilleros Huelva	2
Spain	Astilleros Espanoles	2

- In the larger sectors, export opportunities increase. In the size range 10,000 to 20,000 GT Japan again dominates almost solely for domestic owners. Some export contracts have been available however, in Europe and elsewhere. 33 orders have been placed in 14 shipyards since 1989, with the market leaders being as follows:

Nationality	Shipyard	Orders Since 1989
Japan	Kanda Zosen	7
Japan	Mitsubishi	6
Netherlands	Van der Giessen	4

These top three builders account for over 50% of the market in this sector.

- Export opportunities are greatest in the largest sector, above 20,000 GT where European shipyards predominate. Japan is virtually absent from this sector both as a builder and owner. 32 orders have been placed in 15 shipyards since 1989, but it is difficult to identify general market leaders. The following are amongst leading builders:

Nationality	Shipyard	Orders Since 1989
Germany	Seebeckwerft	7
Finland	Kvaerner Masa	3
Italy	Apuania	3
Finland	Finnyards	3

9.3.11 Passenger Ships

- The building of passenger ships has never been an important sector for Japan or South Korea. Those ships that are built in Japan are generally for the domestic market and South Korean yards have taken only one passenger ship order in the past 10 years. Market shares since 1989 have been as follows:

Japan : 12%
South Korea: O
Europe : 61%
Other : 27%

- European shipyards lead in this sector and in particular the large cruise ship market has become fairly specialized, with a small number of established specialist builders. 50% of the output of passenger ships in general is exports, but in Europe the statistic is 68%.

- In the smaller size ranges (below 50,000 GT) market leaders are difficult to identify, and order density is low (under 2), showing little specialization in a widely fragmented market. This is particularly the case in the sector below 5,000GT. In addition, ship types are fairly fragmented in this sector, including, for example, Nile cruisers or US riverboats. Many of the opportunities are fairly local in this respect. Leading builders since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
Japan	Mitsubishi	4
Egypt	Giza Shipyard	8
Belgium	Laugerbrugge	4
Egypt	Arab Constructors	4
Italy	CL EMNA	5
Denmark	Orskovs	4

- In the range 5,000 to 10,000 GT, Germany's Meyer Werft is the leader, with a wide range of builders with single orders apart from that yard. Again the market in this sector is highly fragmented. Builders since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
Germany	Joseph Meyer	7
France	ACH	1
Germany	Seebeck Werft	1
North Korea	Chongjin	1
Finland	Rauma Repola	2
Italy	Esercizio	1
Japan	Mitsubishi	1
Japan	Hayashikane	1

- The problem of fragmentation remains in the sector between 10,000 and 20,000 GT. European yards again predominate, but with a wide range of shipyards taking opportunities that may arise. 34 orders since 1989 have been placed in 19 shipyards, the following having taken more than single orders:

Nationality	Shipyard	Orders Since 1989
Spain	Levante	3
Italy	Visentini	4
Norway	Fosen MekVerk	2
Japan	Mitsubishi	3
Germany	Volkswerft	3
Germany	MTW	2
Germany	Meyer	2
France	ACH	2
Norway	Langsten Slip	2
Norway	Kvaerner Kleven	2

- In the larger sectors, above 20,000 GT, specialization becomes greater. European shipyards dominate and export opportunities are good, although order numbers are small. me following orders have been placed since 1989:

Nationality	Shipyard	Orders Since 1989
20,000 to 50,000 GT		
Finland	Kvaerner Masa	3
France	Chantiers de L'Atlantique	2
Germany	Meyer.	1
Finland	Finnyards	2
Japan	IHI	2
France	ACH	1
Japan	Mitsubishi	1
Russia	Baltic	1

Nationality	Shipyard	Orders Since 1989
Over 50,000 GT		
Italy	Fincantieri	9
Finland	Kvaerner Masa	7
France	Chantiers de L'Atlantique	5
Germany	Meyer	4
Germany	Bremer Vulkan	2

It can be seen from this that the market for large cruise ships, above 50,000 GT is particularly highly specialized, with only five yards participating at this time.

9.3.12 RoRo Cargo

- This is an important sector for US owners, who own just under 8% of the fleet, 66% of which (63 ships) are US flag. Export potential could only be described as reasonable at best. Order volumes are fairly low and around 56% of orders since 1989 have been for domestic owners. In the five years prior to 1989, 83% of orders were from domestic builders.

- Market shares since 1989 have been as follows:

Japan	:	32%
South Korea:		1%
Europe	:	37%
Other	:	30%

Japan has exported very little in this sector over the last 10 years, concentrating on domestic opportunities. In addition, exports from European shipyards (60% of orders since 1989) have almost solely been for owners within the same European block, and export potential in this sector is difficult.

- Market leaders are difficult to identify, with a generally fragmented order book in all sectors. The following shipyards were identified from an analysis of the order book since 1989:

Nationality	Shipyard	Orders Since 1989
<5,000 GT		
Japan	Kitanihon	6
Denmark	Orskovs	5
Romania	Galatz	5
5,000 to 10,000 GT		
Croatia	Kraljevica Bred	3
Croatia	Sava	4

Nationality	Shipyard	Orders Since 1989
10,000 to 20,000 GT		
Russia	Baltic	3
Spain	Astilleros Espanoles 3	3
Netherlands	Van der Giessen	3
Italy	Fincantieri	3
Japan	Mitsubishi	3
20,000 to 40,000 GT		
Germany	Flender	2
Brazil	Emaq	2
>40,000 GT		
USA	Avondale	3
USA	National Steel Corp	3

9.3.13 **Car Carriers**

- This sector is dominated by Japan, as both principal owner and builder. It goes without saying that Japanese ships in this sector are built in home shipyards.

- The export market is covered by Japan and South Korea and market shares since 1989 have been as follows:

Japan :	75%
South Korea:	18%
Europe :	6%
Others :	1%

- This is, in fact, a small niche sector, and opportunities are likely to be difficult to identify, although some shipyards have established track records. The main builders since 1989 have been as follows:

Nationality	Shipyard	Orders Since 1989
<10,000 GT		
Japan	Usuki	**5**
Norway	Brattvag	**4**
Japan	Shin Kurishima	**3**
Japan	Miho	**2**
10,000 to 20,000 GT		
Japan	Mitsubishi	2

Nationality	Shipyard	Orders Since 1989
20,000 to 40,000 GT		
South Korea	Hyundai	3
Japan	Shin Kurishima	2
>40,000 GT		
Japan	Oshima	7
South Korea	Daewoo	5
Japan	Mitsubishi	5
Japan	Kanasashi	4
South Korea	Hyundai	4
Japan	Shin Kurishima	3

It should be noted that a number of the above shipyards in Japan and South Korea have links also with car manufacturers.

9.4 SHIPBUILDING CAPACITY AND SUPPLY AND DEMAND BALANCE

The measurement of capacity in an absolute sense is extremely difficult. The potential output from a shipyard is determined by a number of factors:

- Physical facilities, in particular the number and type of launching facilities, berth cranage, area and balance of workshops and standard of equipment.
- Availability and level of training of the workforce, working practices and productivity.
- Infrastructure, availability and quality of sub-contractors.

Clearly, to estimate this level of detail to come up with an absolute value for each shipyard in the world would be prohibitive. Even if the resource were available to do this, so many assumptions would be required that the result would lack any real certainty, due to the highly subjective nature of the calculations. For example, a decision would have to be made as to how many shipbuilding berths are actually working : many are to some extent de-commissioned. This would require that each shipyard's future strategy is ascertained (which presumes that the strategy exists), or at least that strategies are 'second guessed'. The same comment applies to the sphere of operation : shipyards with panamax capability may well operate in the handysize sector, for example, which will have a material effect on capacity.

The specification of appropriate units is also difficult. Capacity is often quoted in gross tonnes, although for reasons outlined earlier, this is limited. in the Consultant's view, specification in terms of CGT is arguably the most appropriate single measure, although as with any other measure this has drawbacks.

Figure 3.2, presented earlier, indicated that the number of shipyards currently actively trading has leveled out at around 330. This is well below the peak of 435 shipyards that were still trading at the start of the 1980s, with many having ceased trading during the worst of the shipbuilding depression. The number of yards trading has risen significantly from the low point in 1987/88, when it fell below 200. The extent of the ability of shipyards to re-activate, in some cases coming out of mothballs, has been surprising, but the situation has now stabilized.

APA estimates that the current level of capacity is around 16 million to 18 million CGT per annum. This concurs with an estimate undetaken by the Japanese Maritime Research Institute and Nomura Consulting, which estimates current capacity more precisely at 16.3 million CGT per annum.

Capacity is not static however, and capacity is expected to expand through three main mechanisms:

- The number of shipyards available will increase due to shipyard expansion and the construction of new yards.

- New capacity previously unused in international commercial shipbuilding, may convert to the international sector, in particular from the United States and Former Soviet Union.

- Existing capacity will increase as productivity improves.

Major new shipyards are known to be planned in South Korea, China and Germany. The expansion in South Korea is the most significant, with an expected expansion in capacity from 5 million gross tonnes per annum in 1994 to 9.5 million gross tonnes per annum by the year 2000. The effects of this expansion have been seen already, with deadweight on order in Korean shipyards increasing from a previous peak in 1992 of 16.9 million dwt, to a current level of 24.7 million dwt.

Chinese expansion is currently more limited, and is primarily aimed at establishing capacity in the larger sectors of the market. A new VLCC dock is currently being commissioned at Dalian, but the steelwork facilities to support the dock have not yet been built, and at this time the capacity of this dock is therefore limited. This is indicative of the likely pace of expansion in China and capacity expansion is most likely to stem in China from increasing and more efficient utilization of existing facilities. A new shipyard is also planned at Wai Gao Qiao, South of Shanghai, to build VLCCs, but this is unlikely to be operational much before the end of the decade.

The development in Germany is complex, shipyards at Volkswerft, Peenewerft, Elbewerft, MTW, Kvaerner-Warnowwerft and Meyerwerft are being re-developed or re-built. Under EEC rules, no capacity expansion is permitted during this re-development and so technically no capacity increase will stem from German shipyards.

Many Eastern European shipyards have a strong track record in international shipbuilding, in particular in Poland, Romania and Croatia (formerly part of Yugoslavia) and liberalization of the former Eastern bloc will have, in general, a very limited effect on capacity available. The Former Soviet Union is a different matter however. Soviet capacity concentrated heavily on constructing Soviet ships, and liberalization has seen all former Soviet yards turning towards the international market. The effect should not be over-emphasized however. APA have surveyed much of the capacity available in the FSU and much of it is obsolete and in a very poor state of repair. It is conceivable that some investors may upgrade existing facilities to some extent, although in general it is a safe assumption that those shipyards that are likely to be successful in penetrating the international commercial market have already done so, and are counted in existing capacity. It remains to be seen how successful the shipyards that have taken orders will be; doubts remain ever delivery performance and the ability of former Soviet yards to complete contracts.

The entry of US shipyards may have a more marked effect, although the exact extent depends on how successful US shipyards will be in their strategies to gain market share. In theory the available capacity could be fairly high, given the extensive range of facilities available in the US. However, ultimately the success of US shipyards lies in their ability to achieve competitive performance levels, and the reader is referred to NSRP Project 4-93-2 for a detailed evaluation of the current level of competitiveness, and targets.

Figures 9.2 to 9.4 present a summary of the forecast levels of demand set against an estimate of future capacity based on controlled expansion. An estimated expansion rate of 4% per annum has been assumed. It should be noted that 100% capacity utilization is unlikely to be achievable, and 85% is more likely to be a sustainable long term target.

The following characteristics should be noted from the attached graphs:

- Capacity utilization is forecast to reduce following the peak of demand at the start of the next decade. This clearly shows the need to control capacity expansion to avoid utilization falling to low levels even though demand may expand.

- The forecast predicts that the level of capacity available will be sufficient to meet demand, with good levels of utilization seen around the turn of the century. Only in the high case scenario, is available capacity exceeded by demand, and in this scenario expansion may have to be accelerated to cope with demand.

- The Japanese Maritime Research Institute estimate that capacity will rise to 27.6 million CGT by 2005, as illustrated in Figures 9.5 to 9.7. This implies an average rate of growth of 6% per annum, although with the highest levels of capacity increases seen in the period up to 2000, as existing expansion programs come on stream. It is APA's view that this level of expansion is representative of uncontrolled expansion, producing excessive capacity.

If the higher levels of expansion of capacity predicted by JAMRI materialized, capacity utilization would achieve reasonable levels predicted by the year 2000, but falling off thereafter to disappointing levels by the end of the forecast period. This would lead to low prices, and a return to subsidies. The need for restrained and controlled capacity expansion is confirmed by comparing these scenarios.

Figure 9.2 : FUTURE SUPPLY & DEMAND - LOW CASE

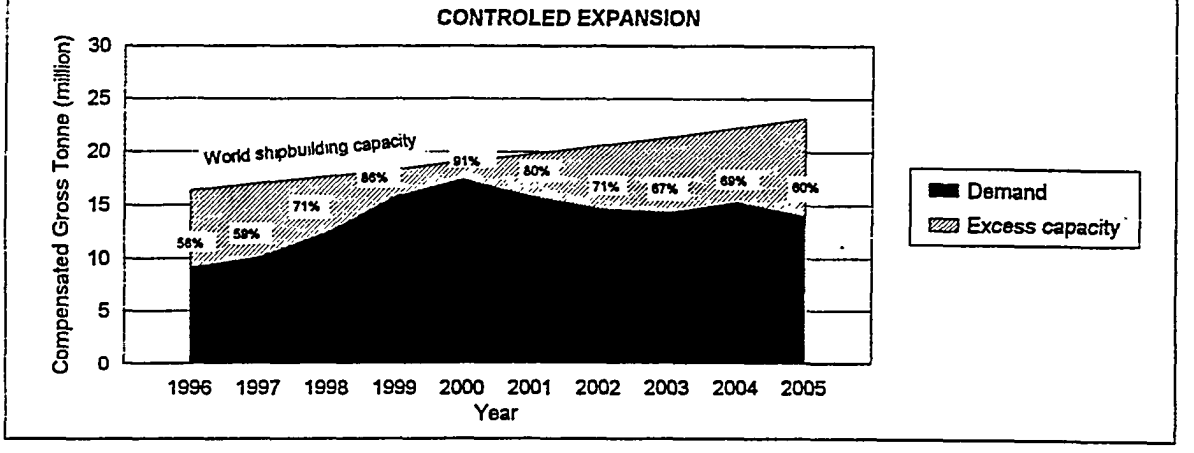


Figure 9.3 : FUTURE SUPPLY & DEMAND - BASE CASE

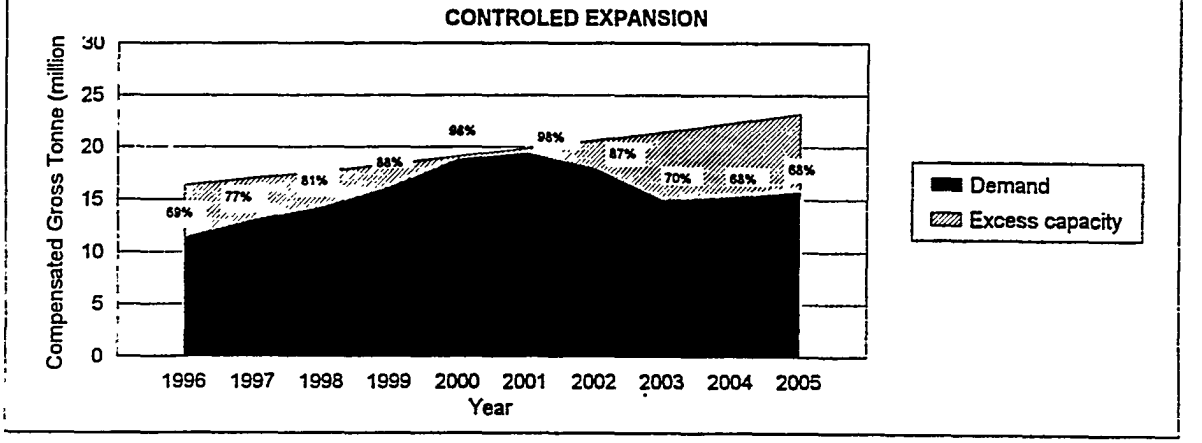


Figure 9.4 : FUTURE SUPPLY & DEMAND - HIGH CASE

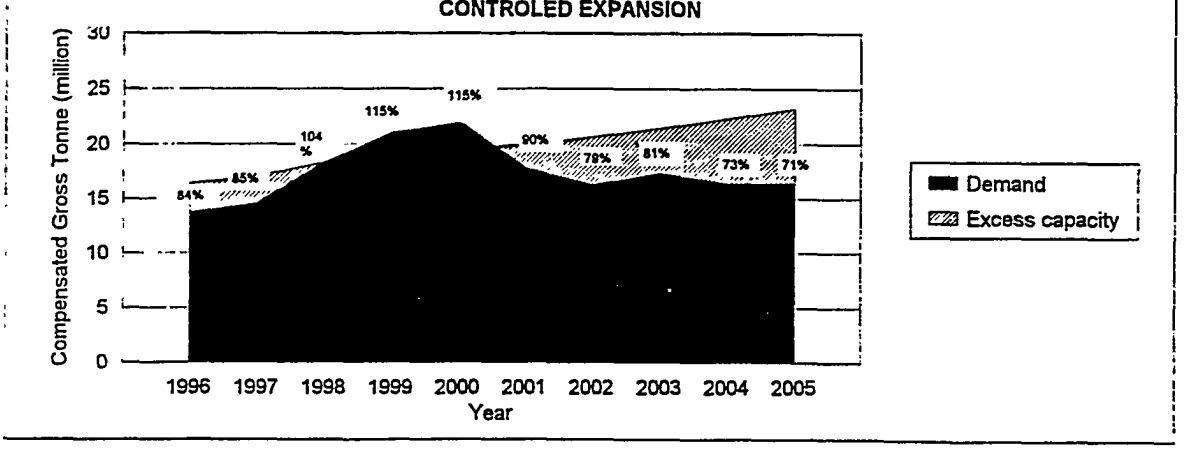


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Figure 9.5 : FUTURE SUPPLY & DEMAND - LOW CASE

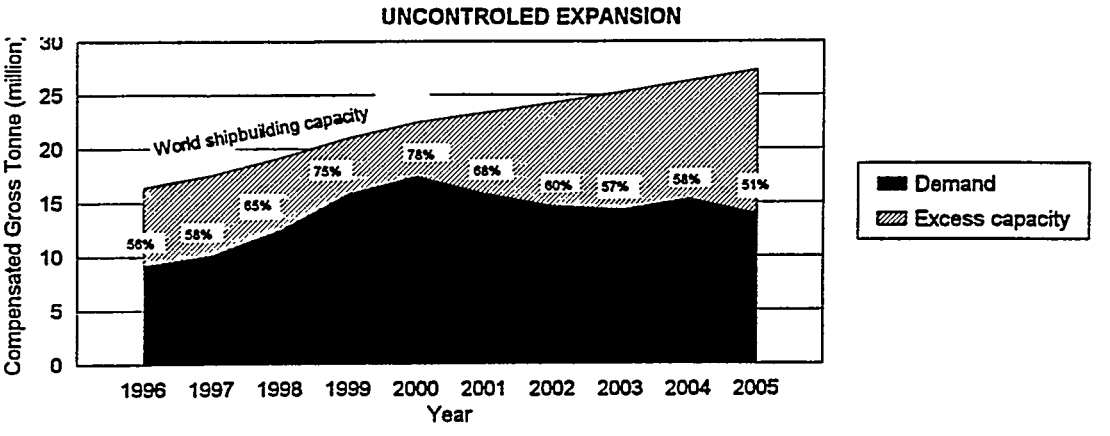


Figure 9.6 : FUTURE SUPPLY & DEMAND - BASE CASE

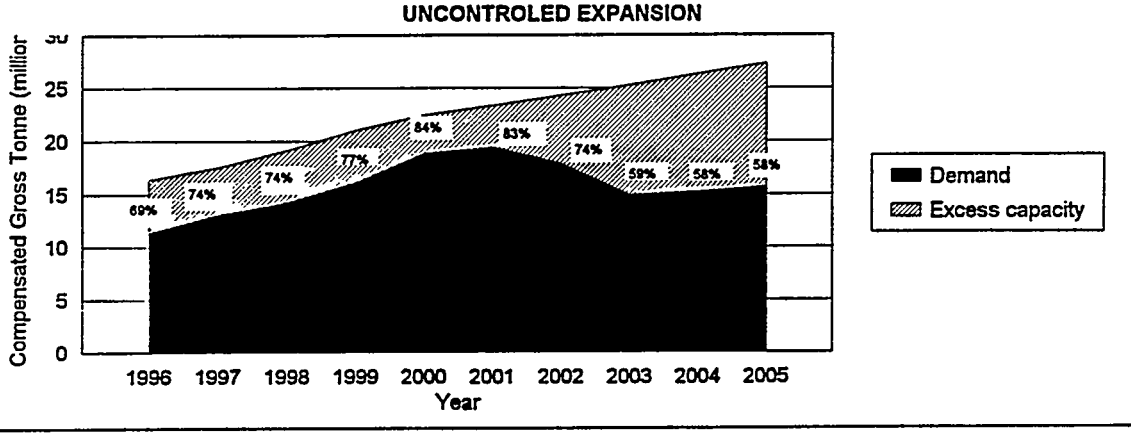
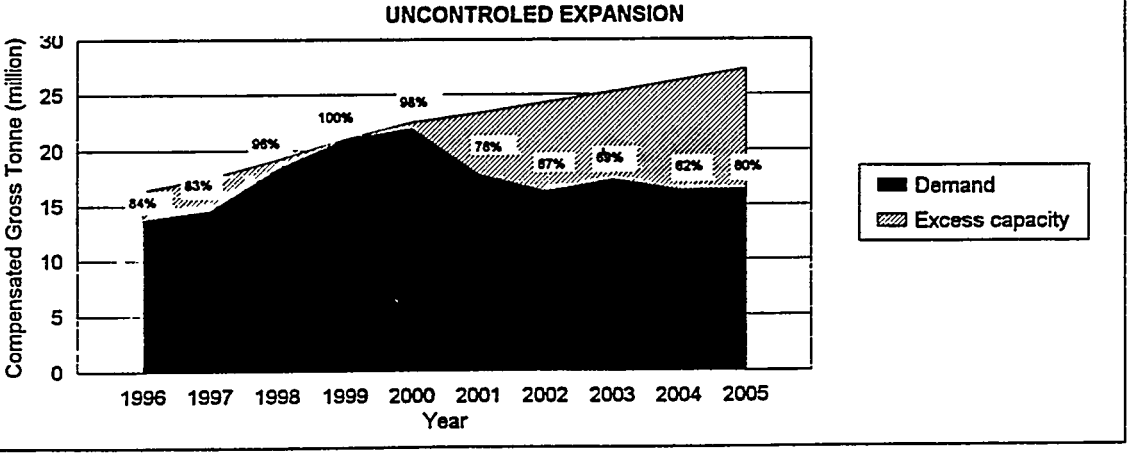


Figure 9.7 : FUTURE SUPPLY & DEMAND - HIGH CASE



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10. PRICE AND BUYER VALUES

Through contact with shipowners, APA have investigated the attributes that make up the marketability of a design. 11 factors were reviewed, as follows:

- Price
- Financing
- Delivery
- Minimum Crew
- Speed
- Fuel Consumption/Economy
- Capacity
- Efficient Cargo handling
- Safety
- Design/Operational Considerations
- Other Factors.

Owners' reaction to these factors is discussed in detail below. However, the unanimous response to this question was that within reason, first cost (and finance arrangements insofar as they effect cashflow), is of prime importance. This was expressed strongly by all persons interviewed. Beyond this, the two most important factors are re-sale value and ease of operation, the implications of which are discussed below.

The state of the freight markets is such that operating profits alone are unlikely to justify the purchase of a new vessel, and ultimate sale of the ship is a vital factor in the economic equation reviewed by a prospective owner. For this reason, the ship must be high quality and easy to maintain. The use of high tensile steel, whilst essential in some areas, should be reduced over that seen in recent years and high quality epoxy coatings in all ballast tanks is seen as essential.

The second most important consideration is that the vessel should be simple to operate and maintain. There is a severe shortage of competent crews worldwide and easy to handle winches, hatches and cranes are required, in addition to easy maintenance. This is not to say that minimum manning is a desirable feature and, in fact, in general the opposite view is taken. Whilst UMS and other standard features are essential, the option to minimize crews is a function of current legislation and as such is seen as a high risk option. With ship safety currently to the fore in the minds of the principal legislative bodies such as the IMO, regulations as to minimum crews are likely to get tighter rather than easier.

Low fuel consumption is also viewed with suspicion by owners. In general, HFO costs are seen as very low in relation to other operating costs, with a low penalty for higher consumption. Low fuel consumption is generally achieved by low power engines, which fail to maintain an adequate speed in heavy weather. Thus, whilst on paper the trial speed and fuel consumption may appear to be attractive, this is far outweighed by the potential charter penalties when the vessel cannot maintain the required speed. In fact, recent legal changes giving greater latitude to the charterer in claiming performance penalties indicates that very low fuel consumption is an undesirable feature.

This is not to say that the quality of design is not important. The quality of a design is likely to be reflected in the likelihood of achieving a sale, but not in the price; good design is unlikely to achieve a premium above the market price.

The shipbuilding industry operates in a commodity market, and prices rise and fall with supply and demand. Figure 10.1 presents an index of how newbuilding prices have moved since 1987, and an index of how orderbook deadweight has moved over the same period.

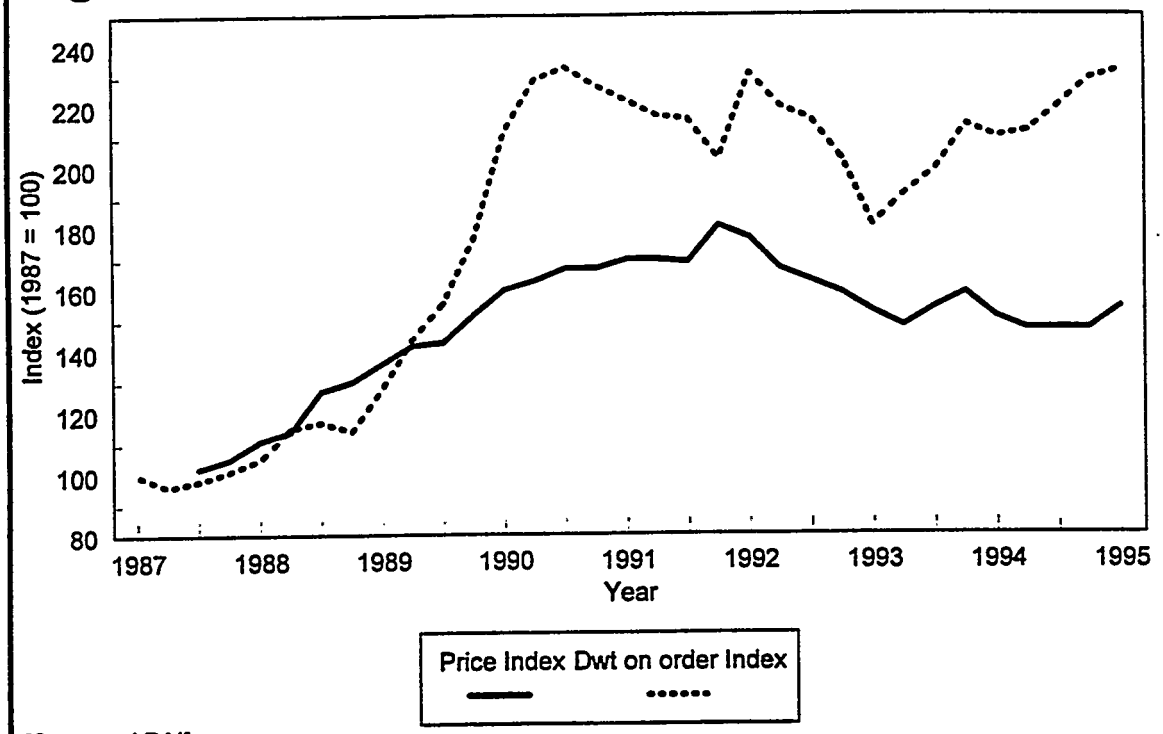
Prices rose well following the bottom of the market in 1987, and by the end of 1991 the price index had risen to a level of 183: in other words the level of prices had risen to 83% above the low point in 1987. This point was significant, in that many yards had good forward orderbooks, and at this level of price the best shipbuilders were starting to generate unsubsidised profits and the potential to phase out subsidies was present. The EEC subsidy ceiling had been progressively reduced to 9% (from an original 36%), and was due to be phased to zero within two years. Subsidies had already been eliminated in Denmark.

The situation did not develop as expected however, and in 1992 orderbooks fell and prices fell in response. By mid 1993, prices in general had fallen by 30% and have remained at around that level since that time. In this situation, subsidies have been reinforced.

Prior to 1993, the orderbook and price indices followed each other with a high degree of correlation, as shown in Figure 10.1. Since 1993 however, orderbook volume has been rising without any consequent rise in price. The reason for this can be traced to the bringing on stream of new capacity in South Korea, clearly shown in Figure 10.2. South Korea has been soaking up orders to fill new capacity, and as such prices have remained static. With South Korean yards now booking orders for 1997, it is thought that the capacity is substantially full, and as can be seen from Figure 10.1, prices have begun to rise again.

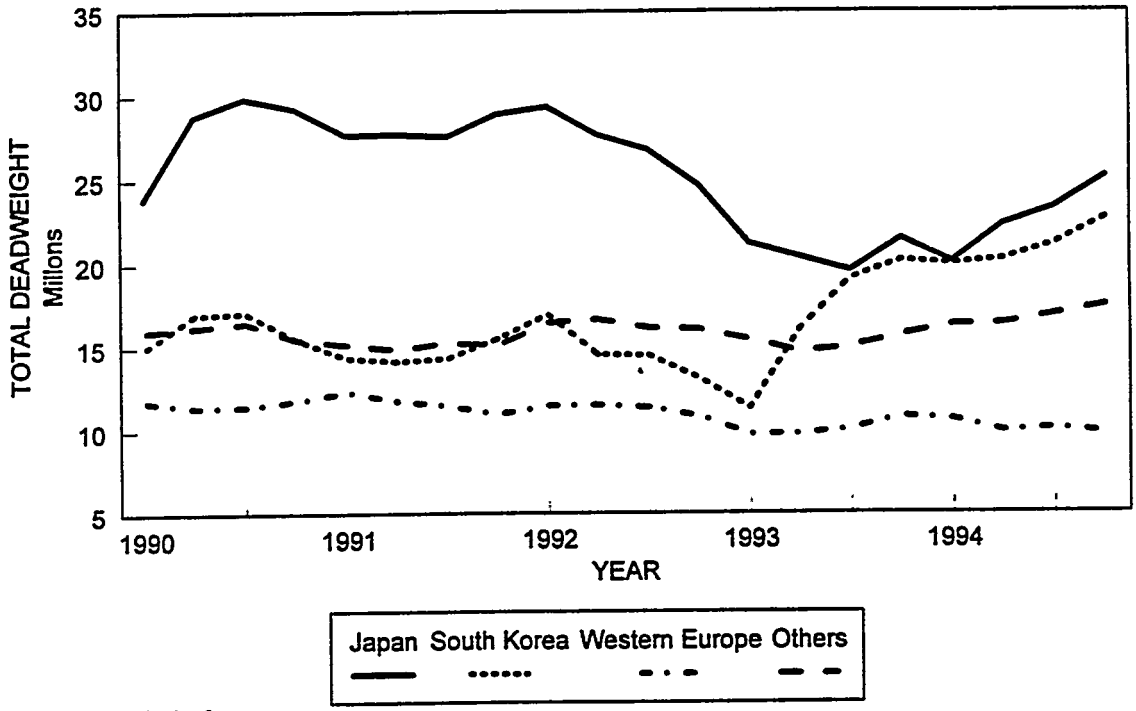
It should be noted that price stagnation cannot be blamed totally on South Korea. South Korean shipyards concentrate on larger sectors of the market, and whilst the effects filter down into other sectors of the market, there are other specific price leaders in some areas. This comment particularly appertains to Poland's lead in the containership market, with Polish shipyards at this time holding containership prices low, and soaking up orders. It has to be said that it remains to be seen whether the shipyards can continue to operate at the prices offered.

Figure 10.1 : PRICE AND DEADWEIGHT INDEX



[Source: APAI]

Figure 10.2 : TOTAL DEADWEIGHT ON ORDER



[Source: Fairplay]

The expansion of South Korean capacity has undoubtedly affected the elasticity of the market, although insufficient movement has been seen yet to measure by how much. In addition, the shipbuilding cycle does not operate in isolation. Unlimited price rises will not be supported by freight rates and the relationship between demand and price is not a continuous straight line: it will level off at some point.

Forecast capacity increases will also have an effect as prices fall again following the peak of demand around the turn of the century, and if capacity is not controlled then price fall will result - as has been the case in the past.

Detailed analysis suggests that, now that South Korea's orderbooks are reasonably full, and based on the forecast forward demand, the price level of 180 (ie, around 30% higher than current levels) should be achieved fairly quickly, rising more slowly thereafter to an ultimate level of around 190 (ie, around 40% higher than current levels). It is conceivable that prices could rise slightly higher than this, up to around the 200 mark, but it is unlikely that freight rates would support a price any higher than this.

Based on the forecast levels of demand developed in this study, the following price scenarios are predicted:

- **Low Case:** Prices will recover over 1995 and 1996, to achieve an index level of 180 by the end of next year. Prices would continue to rise through 1997 to the 190 level, leveling off thereafter before falling again in the year 2000. Because of forecast capacity increases prices would fall quickly thereafter to settle at a level somewhat below the 180 mark, although close to it, leveling off at that level until the end of the forecast period.

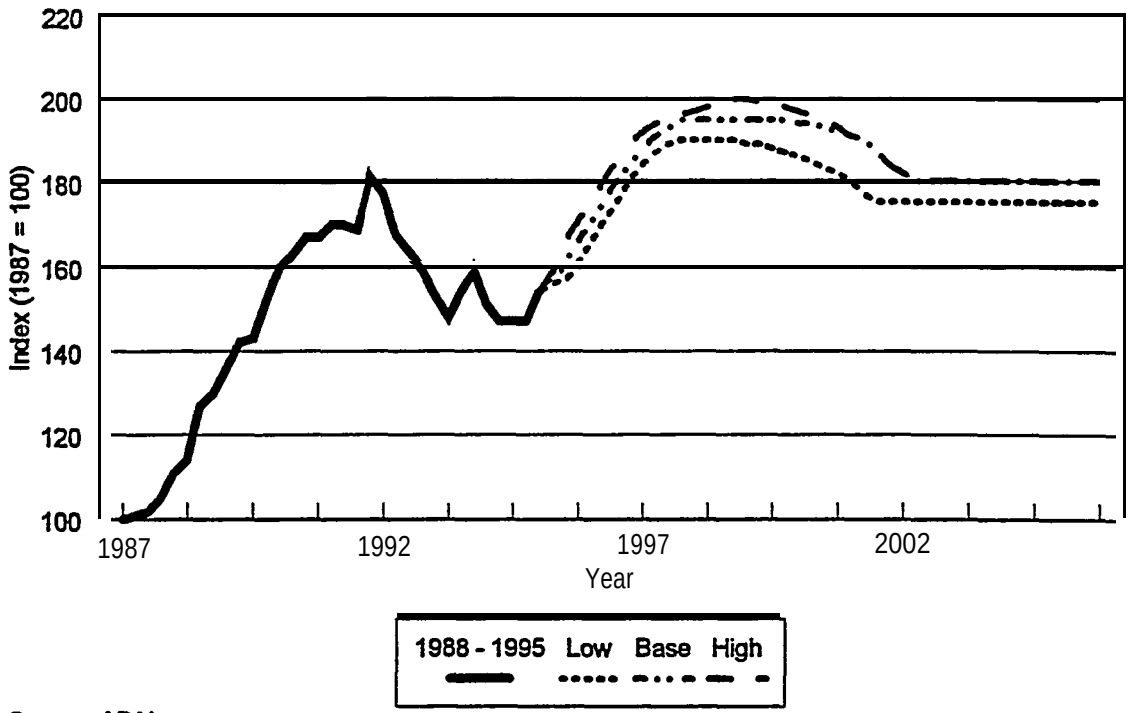
- **Base Case:** Prices will recover over 1995 and 1996, to achieve an index level of 180 by the second half of next year. Prices would continue to rise through 1997 to a level around 190, leveling off at that level until 2001, falling back to a level of 180 by mid 2002 and leveling off at that point to the end of the forecast period.

- **High Case:** Prices will recover over 1995 and 1996, to achieve an index level of 180 by the middle of next year, rising to the 190 level or above (possibly up to 200) by mid 1997. Prices would remain at this level up to 2001, falling slowly after that point to reach the 180 level again by the end of the forecast period.

These scenarios are illustrated in Figure 10.3.

It should be noted that these forecasts depend on a restrained expansion of capacity. Uncontrolled expansion would see prices fall quickly, in particular after 2002. If the higher levels of capacity expansion discussed in Section 9 of this study are seen, then prices will quickly fall back to around the 150 level after this time and the cycle of subsidy will be re-started.

Figure 10.3: FORECAST PRICE INDEX



Source: APAI

The above discussion of price and forecast forward prices considers the market in general. As discussed earlier however, there are localized effects that mean that pricing is not homogeneous throughout the fleet : the low price of containerships, driven by Polish shipyards, is a very good example.

Great care has to be taken with comparison of prices. For example, LNG ships have both a very high labor content and a high material content, and absolute price is therefore very difficult to compare with, say, a bulk carrier.

Ultimately, the price behavior in each specific sector should be studied in detail by any shipyard planning to target that sector, reviewing price implications against performance targets and the capability of the shipyard concerned. For the purposes of this study, the published prices of key ship types have been analyzed (using data from Lloyd's Shipping Economist) to examine the relative value of each type. An estimate of material cost has been subtracted from the price and the resulting added value divided by the compensated gross tonnage, to obtain the level of income per unit of output. In this way, prices are compared on a common base.

The results are presented in Figure 10.4, with key results as follows:

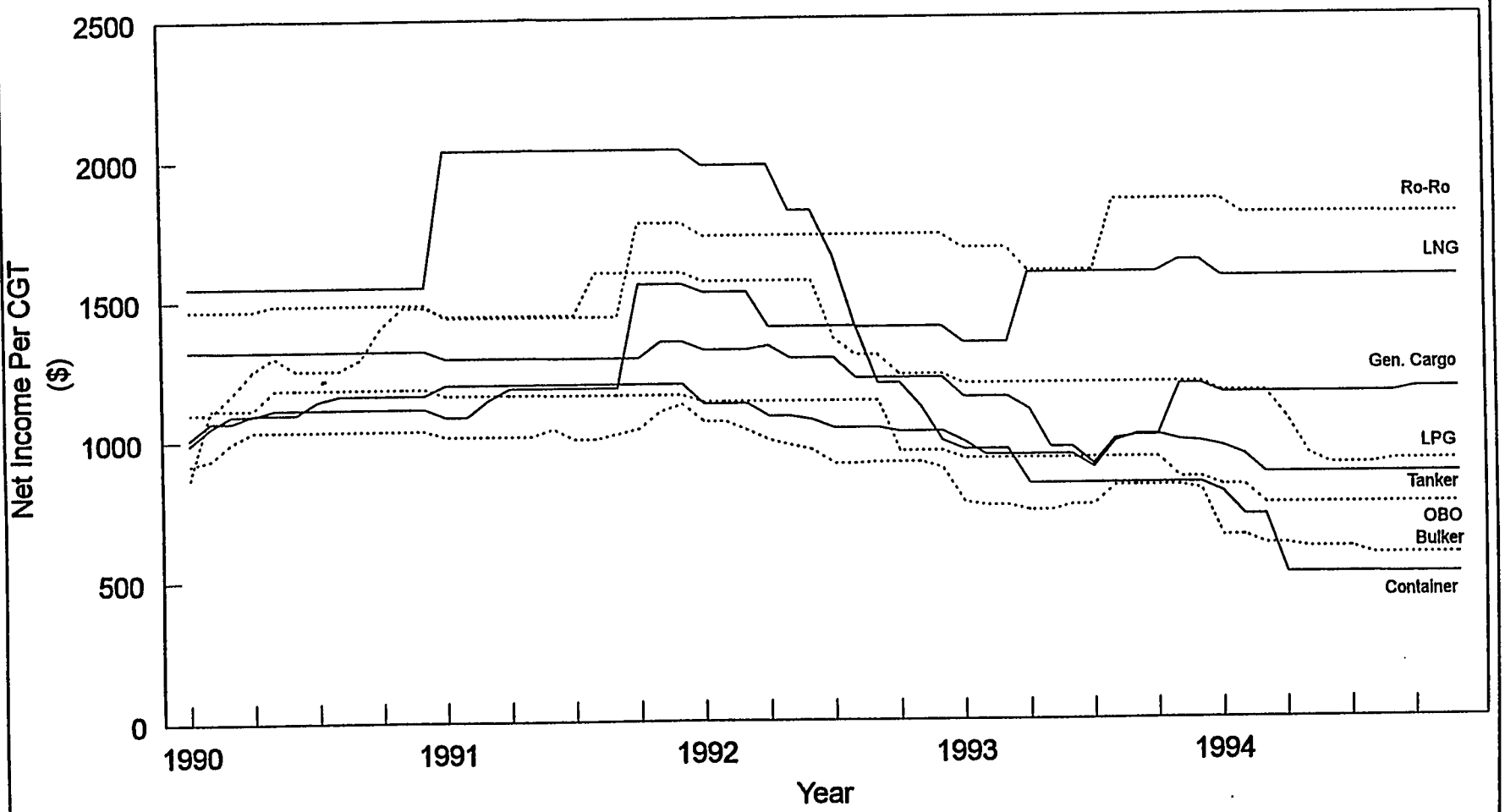
- Prices have fallen since 1991 but have proved most resilient for LNG carriers and RoRos. These two ship types currently earn a significantly higher value than other sectors, at above $1,500 per CGT produced.

- Similar levels of price are achieved by general cargo ships, LPG carriers, tankers and OBOs at around $1,000 per CGT produced.

- Prices are disappointing for both bulk carriers and container ships, at around the $500 per CGT level. This would be a very difficult level at which to compete and is driven by the high level of competitiveness in these sectors. The largest price falls since 1991 have been seen in these sectors, and this compounds the competitive difficulties in the container sector. The implications should be less for bulk carrier builders, with this ship type lending itself to automation and series throughput, leading to potentially very high productivity.

Figure 10.4 : PRICE PER UNIT OUTPUT

(1990 - 1994)



[Source: L.S.E / APAI]

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